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Living Creatures of Water, Land and Air

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McGUFFEY'S NATURAL HISTORY READERS

LIVING CREATURES

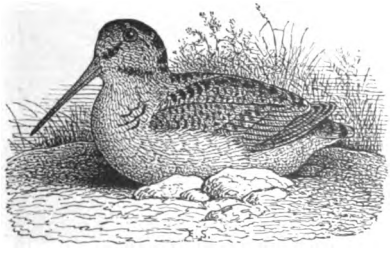
OF

WATER, LAND, AND AIR

FOR THE FOURTH READER GRADE

BY

JOHN MONTEITH, M.A.



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CINCINNATI AND NEW YORK

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PREFACE.

THE object of McGUFFEY'S NATURAL HISTORY READERS is primarily to furnish to children, both at home and in school, interesting and instructive reading in the form of book literature. While no attempt is made to teach science, the hope is cherished that the descriptions of animal habits and characteristics may, incidentally, stimulate a love of nature, and of science, the interpreter of nature.

"FAMILIAR ANIMALS," addressing a lower grade of advancement, confined its subjects to mammals, because the facts connected with this class are apparent, and are more easily comprehended.

"LIVING CREATURES," in respect to grade of thought and expression, takes a step forward. Treating of animals scarcely less familiar, and even more interesting, it enters the field of the lower groups of animal life, where the facts are more remote from ordinary view, demanding closer attention and thought.

To render the illustrations in the highest degree accurate and helpful, the publishers have employed the services of artists whose study and practice have made them specialists in particular departments of animal drawing.

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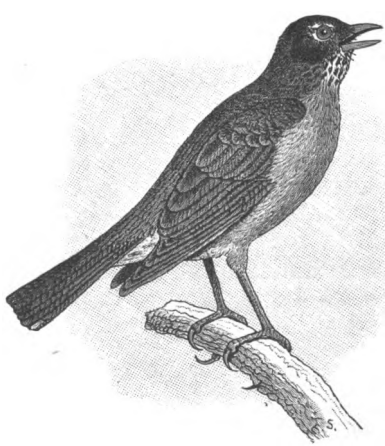
CONTENTS.

LESSON			PAGE
1.	Eyes and No Eyes	*Mrs. Bárbauld.*	5
2.	A Busy Skeleton		11
3.	Jewel-makers and Island Builders		18
4.	Among the Shells		23
5.	The Clam		26
6.	The Clam's Shell		32
7.	Some Uses of Clams		35
8.	The Oyster		38
9.	Oyster-catching		44
10.	Pearls and Pearl-makers		48
11.	The Snail		53
12.	The Snail's Gay Relations		57
13.	Living Pinchers		62
14.	Crabs		65
15.	Leeuwenhoek		67
16.	Spiders		70
17.	Miss Spider's Wedding Breakfast	*Miss Barr.*	76
18.	Among the Insects		76
19.	A Musical Burglar		83
20.	To a Mosquito	*Bryant.*	88
21.	The House Cricket	*Rennie and Westwood.*	89
22.	Crickets of the Field	*Rennie and Westwood.*	91
23.	Busy Bees		92
24.	A Nice Little Housekeeper	*Jenny and the Insects.*	101
25.	Butterflies and Moths		108
26.	The Silk-worm		112
27.	Facts About Insects		116
28.	Among the Fishes		124
29.	Roman Fish Ponds	*Rev. W. Houghton.*	132
30.	"I Go A Fishing"		135
31.	Another View of Fishing		139
32.	Toads and Frogs		140
33.	Snakes		145

Digitized by Google

LESSON			PAGE
34.	How a Turtle Taught a Lesson	*St. Nicholas.*	150
35.	The Box-tortoise and Its Kin		154
36.	Lizards and Crocodiles		157
37.	Audubon		160
38.	Among the Birds		165
39.	Water-skimmers and Flyers		171
40.	Wading Birds and Shore Birds		174
41.	The Stork	*Miss Kirby.*	178
42.	Birds of the Land		180
43.	The Camel-bird		182
44.	Birds of the Air—The Pigeon		185
45.	"Lions of the Air"		188
46.	Monkeys in Feathers		192
47.	Red-head and his Music		194
48.	The Canary	*W. T. Green.*	196
49.	The Crow		198
50.	Facts About Birds		200
51.	A Bird Nation		202
52.	The Great Singers		205



Robin-redbreast.

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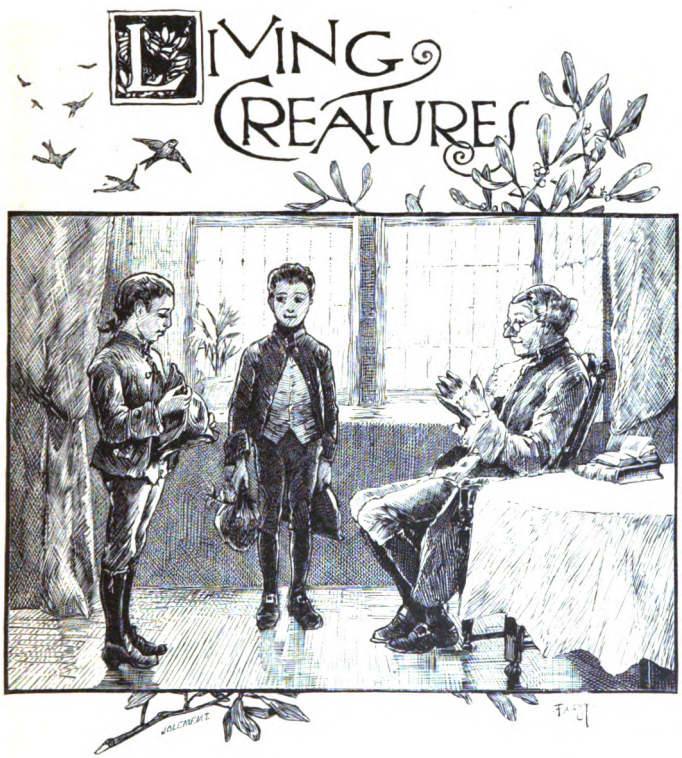

I. EYES AND NO EYES.

MORE than a hundred years ago, lived Mrs. Barbauld in a quiet place in England where, with her husband, she kept a small school for children. Her deep interest in her pupils and in children generally, together with her simple and pleasant style of writing, made her a great favorite. Her books for the young are among the few that have outlived the age in which they appeared.

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One of the charming little books containing Mrs. Barbauld's writings is entitled "Evenings at Home." In it is included a story called "Eyes and No Eyes, or the Art of Seeing." This story is here selected and adapted to introduce some short histories of living creatures that are to be found in this marvelous world in which we live. These creatures could never have been described had there been no sharp and careful eyes. Much less can their wonderful characters be understood unless dull and thoughtless eyes can be made bright and quick. Sharp wits follow sharp eyes.

A few words of explanation must precede the two boys in the story. They lived a hundred years ago, and wore the dress peculiar to their time. Their coats were short, and were called "monkey-jackets." Their trousers were tight, and terminated at the knees. Then followed long stockings and very low shoes, which were apt to stick in the mud and come off.

Boys, a hundred years ago, had a bad habit of carrying their hands in their pockets, when they had pockets. The best way to cure them of this habit was to sew up the pockets, or, better, to have no pockets at all. The latter was precisely the case with the two boys of Mrs. Barbauld's story. The only pocket they had was just capacious enough to hold a handkerchief. This fact will explain the reason why, when the boy of a hundred years ago found rusty nails, pieces of tin and glass, wet clams and dirty marbles, he did not, like the boy of to-day, thrust them into his pocket, but rather tied them up in his handkerchief. But stop! One of the boys is coming in to see Mr. Andrews, his teacher.

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"Well, Robert, whither have you been walking this afternoon?" asked Mr. Andrews, as the lad entered his room at the close of a holiday.

"I have been, sir, to Brown Heath," replied Robert, "and around by the windmill on Camp Mount, and home through the meadows by the river."

"Well, that is a pleasant round," said Mr. Andrews.

"I thought it very dull, sir," said Robert. "I scarcely met with a single person. I had rather by half have gone by the turnpike road."

"Why yes, if seeing men and horses were your object, you would indeed have been entertained on the high-road. But did you see William?"

"We set out together," answered Robert, "but he lagged behind in the lane; so I walked on and left him."

"That was a pity," Mr. Andrews said. "He would have been company for you."

"O, he is so tedious, always stopping to look at this thing and that," said Robert, impatiently. "I had rather walk alone. I dare say he has not yet got home."

"Here he comes! Well, William, where have you been?" asked Mr. Andrews of the boy who had lagged behind.

"O sir, the pleasantest walk!" answered William.

"I went all over the Brown Heath, and so on up to the mill at the top of the hill, and then down among the meadows by the side of the river."

"Why, that is just the round Robert has been taking," exclaimed Mr. Andrews, "and he complains of its dullness, and prefers the high-road."

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"I wonder at that," said William. "I am sure I hardly took a step that did not delight me, and I have brought home my handkerchief full of curiosities."

PART 2.

"SUPPOSE, then, you give us some account of what amused you so much. I fancy it will be as new to Robert as to me," suggested Mr. Andrews.

"I will, sir," said William, cheerfully. "On the road leading to the Heath, I spied a thing curious enough, in the hedge. It was an old crab-tree out of which grew a great branch of something green, quite different from the tree itself. Here is a branch of it."

"Ah!" exclaimed Mr. Andrews, "this is the mistle-toe, a plant of great fame on account of the use made of it by the Druids of old in their religious rites. It is one of those plants which do not grow in the ground by a root of their own, but fix themselves upon other plants; whence it is styled a parasite."

"A little further on," continued William, "I saw a green woodpecker fly to a tree, and run up the trunk like a cat. What beautiful birds they are! When I got upon the open heath, how charming it was! The air seemed so fresh, and the prospect so free and wide! Then it was all covered with gay flowers, many of which I had never seen before. I saw several birds that were new to me. There was a flock of lapwings that amused me much. As I came near, some of them kept flying round and round just over my head, and crying *pee-wit*, so distinctly one might almost fancy they spoke. I thought I should have caught one of

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them, for he flew as though one of his wings was broken, and often tumbled close to the ground. But as I came near, he always made a shift to get away."

"Ha, ha!" interrupted Mr. Andrews, laughing, "you were finely taken in, then. This was an artifice of the bird's to entice you away from its nest; for they build upon the bare ground, and their nests would be easily observed did they not draw off the attention of those who disturb them by their loud cries and pretended lameness."

"I wish I had known that," said William, "for the bird led me a long chase, often over shoes in water. However, it was the cause of my falling in with an old man and a boy who were cutting and piling turf for fuel; and I had a good talk with them about the manner of preparing the turf, and the price it sells at. I then took my course up to the windmill on the mount. What a wide prospect! I counted fifteen church steeples. From the hill I went straight down to the meadows below, and walked on the side of a brook that runs into the river. There were a great many dragon-flies all about the stream. I caught one of the finest, and have got him in a leaf. But how I longed to catch a bird that I saw hovering over the water, and that, every now and then, darted down into it! It was all over a mixture of the most beautiful green and blue, with some orange color."

"I can tell you what that bird was," said Mr. Andrews. "It was a kingfisher, the celebrated halcyon of the ancients, about which so many tales are told."

"There were a great many swallows, too, sporting upon the surface of the water," continued William.

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"Sometimes they dashed into the stream; sometimes they pursued one another so quickly that the eye could scarcely keep up with them. A little further along, I saw a man in a boat catching eels. While I was looking at him, a heron came flying over my head with large, flapping wings. After I had left the meadow, I crossed the cornfields on the way to our house, and passed close to a marl pit. I picked up a piece of marl which was quite full of shells; but how sea-shells could get there, I can not imagine."

"What a number of new ideas this afternoon's walk has afforded you!" exclaimed Mr. Andrews. "I do not wonder that you found it amusing; it has been very instructive, too. Did *you* see nothing of these sights, Robert?"

"I *saw* some of them," answered Robert, "but I did not take particular notice of them."

"Why not?" asked Mr. Andrews.

"I don't know," Robert answered. "I did not care about them, and I made the best of my way home."

"That would have been right," remarked Mr. Andrews, "if you had been sent on an errand; but as you walked only for amusement, it would have been wise to seek out as many sources of it as possible. But so it is. One man walks through the world with his eyes open, and another with his eyes shut; and upon this difference depends the superiority of knowledge the one has over the other. I have known sailors who have been in all quarters of the globe, and who could tell you nothing but the signs of the tippling houses they visited in different ports, and the

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quality and price of the liquor. On the other hand, a Franklin could not cross the channel without making some observations useful to mankind; while many a thoughtless youth is whirled throughout Europe without gaining a single idea worth crossing a street for. The observing eye and the inquiring mind find improvement and delight in every ramble in town or country.

"Do you, then, William, continue to make use of your eyes; and you, Robert, learn that eyes were given you to use."

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2. A BUSY SKELETON.

WHEN girls and boys are called upon to write out their own thoughts, they are sometimes puzzled to find subjects for this useful and charming exercise. Perhaps they look too far away. The best subjects are near at hand. Here is one, for example: "The school history of a sponge." This airy, thirsty companion of the slate has had an eventful experience. Think over what it has done from the time it was tied to some particular slate down to the moment when it was abandoned for the rubber eraser, and when the slate was put aside for the paper tablet.

The sponge has been a most useful servant, though its work is peculiar. The pencil creates; the sponge destroys. It is an excellent destroyer. How often young brains have toiled hard, and small fingers have worked wearily to build castles and pyramids of fig-

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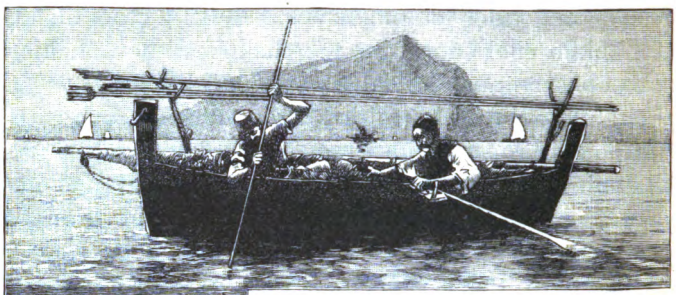

Sponge Fishing.

ures which the sponge, with a single stroke, has wiped out of existence!

The sponge is always a friend to cleanliness. It helps to forget mistakes, and in this way soothes wounded feelings. It has wiped out a great many wrongs—wrong figures, wrong answers, wrong writing, wrong spelling, and innumerable scrawls and awkward pictures which thoughtless pencils have inscribed upon the abused surface of the slate. It would comfort us if we could as easily and completely erase the marks of our wrong deeds from ourselves and from others.

Perhaps it has never occurred to the girls and boys who have so often used the sponge to cleanse their slates and their reputations,

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that they were handling a skeleton. Ordinarily a skeleton is considered a disagreeable thing for a companion; but the sponge is a skeleton as truly as if it were the naked bones of a fish or a cat. And this starts up another thought about the sponge. Our work in the world must be done while we are alive; after we die, our bones are useless. The sponge, while it lives, does no work except to take its food. When it dies its usefulness begins. Then it is that its skeleton, not only in the school-room, but in many of the world's arts, becomes a busy, useful, durable helper.

It may now occur to the reader who has never before thought of it, that the natural history of the sponge may be even more interesting than its school history. What is the sponge? will be an attractive question to answer, after describing the different kinds of sponges and how they are obtained.

The men in the picture represent Dalmatians. They are fishing for sponges. From these hints it is easy to conclude that sponges live in water, and in a particular body of water which may be found by consulting the map. Do not, however, rashly conclude that sponges are fishes. Oysters and pearls are said to be "fished," yet no one should really think they are fishes.

There are sponges which live in fresh water, but they are not the kind which we are now speaking of. The useful sponges come from the shores of the Mediterranean and Red seas, from the Florida coast, and from the Bahama Islands. There are three principal kinds of sponges that are gathered for sale. The large horse or bath sponge is from the Mediterranean and

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the Bahamas. The second kind includes the zimocca of the Mediterranean, and the yellow, or hard-head sponges of American waters. These are all dense, thick, and hard. The third kind is the finest, softest, and most delicate of all, and is the Turkish toilet sponge.

The men in the boat are supposed to be fishing with a five-pronged spear or harpoon. The water must be very quiet to enable them to see their game fifty or sixty feet below the surface. The most ancient way of getting sponges was by diving. To this method the Greek sponge-fishers were trained from childhood. The diver had a stone slab fastened to his feet, and the end of a long rope tied about his waist. A net, or game-bag, to hold the sponges, was hung from his neck. When he reached the bottom, he snatched all the sponges he could see and quickly grasp; then he pulled on his rope to announce that he was ready, and was lifted to the boat. Sometimes, after descending to the depth of a hundred feet or more, the diver would reach the surface in a swoon and bleeding at the nose.

One method by which sponges are now gathered is by dredging or scraping the bottom of the shallow sea-coast with a net. The Greeks, however, use the diving dress. This, in appearance, is something like the ancient coat of mail. It is air-tight and incloses the whole body, covering the head in a helmet in which are windows for the eyes to look through. This helmet is joined by a rubber hose which reaches to a boat on the surface of the water. A pump forces fresh air through the hose to the diver below.

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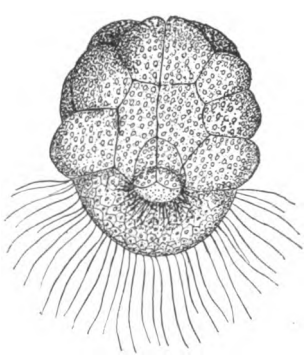
PART 2.

Is the sponge a plant or an animal? Looking at it as it sits on the bottom, one might reasonably take it for a sort of mushroom, or cabbage-head. Ever since sponges came into use, and until within a few years, they have been regarded as vegetables. There are still thousands of people who believe them to be marine plants; for the common impression is that all animals move about.

The sponge is a real animal. This fact was found out, as thousands of wonders in nature have been brought to light, by industrious search, and by the use of sharp eyes. It was discovered that small pieces were somehow separated from the living sponge, and that these chips floated away, and began to grow and move. Eggs were also found in sponges; and from eggs come animals. The little chips and pieces of wool that hatched from the eggs soon throw out long, slender hairs which move like oars, and paddle the tiny animal from place to place.



Young Sponge.

Without eyes and without ears, the little sailor feels its way about in the deep watery world by means of its hair legs. It will run against plants and rocks, as a blindfolded child in the game encounters chairs and

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tables. Then it paddles around the obstacle, and shoves itself away into the free water, asking help of nobody.

By and by this homeless infant settles down on the sea-bottom with its mouth—if a simple hole can be called a mouth—against the place where it is to be fixed. It spreads out a thin, flat membrane which drives out the water beneath it, and then it is held down by the weight of the water above. Here it grows into the little cavities of the bottom, attaches itself firmly, becomes an adult sponge, and ever after remains fixed, or until some fisherman lays his hand or spear upon it.

Far more absurd than the little waif with thread-like legs is the stationary animal now to be explained. It has no head, no tail, no legs, no arms, no eyes, no ears, no real mouth, no stomach, no heart, no lungs, no true blood. It never moves from its place, and yet it is alive. It can not go in search of food, but expects food to come in search of it. Fortunately, the rolling, restless sea takes care of it. There is afloat in some waters a mass of minute vegetables and animals so small as to be seen only with the microscope. These are the food brought to the sedentary sponge by the motherly waves.

The living sponge, like the living human body, has its hard parts and its soft parts. The hard parts of our bodies are chiefly bone; taken together, we call them the skeleton. The hard parts of the sponge are this porous, springy article which is used on the slate and in the bath. This is its skeleton; and it is made of fine, horny fibers. The soft parts of the animal

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have been removed from it. They are a jelly-like substance which lines all the holes and pores of the skeleton. Over the outside of the sponge is a thin, net-like membrane, which opens and closes the canals that run their crooked course from the middle of the sponge to its surface.

Opening and closing its many holes, to let in and throw out food, is about all the work the living sponge does. The floating food is admitted into a large number of tubes or canals, and is carried through a thousand or more cavities which take up the food and digest it. After the nourishment of the food has been received, the useless matter is carried out through the porous canals, and expelled at the surface of the sponge.

On the water-bottoms sponges show all sorts of forms. Some seem to be made of glass threads. Some are flat like sheets. Others are like clumps or small bushes; still others resemble vases.

When they are brought to the surface by the men and boys who fish for them, the sponges are thrown into tanks of water, after which decay soon begins. Then they are taken out and all the soft, or what was living matter, is beaten out of them. After this the skeletons are dried, and are ready for market. When they reach the first market-center they are further cleaned, are cut into regular shapes, and are sometimes bleached by the use of chemicals. The sponge trade at the principal European market amounts to nearly a million dollars annually.

Such is a short, natural history of a busy skeleton, or of a bucket full of holes that never leaks.

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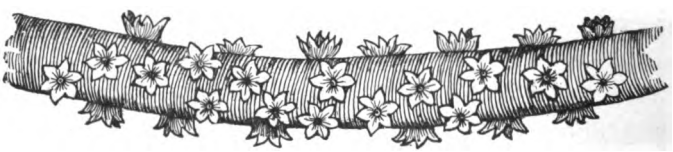
3. JEWEL-MAKERS AND ISLAND BUILDERS.

FIFTY years ago, a pretty ornament in the dress of a young lady was a necklace made of red coral. From the same material cameos were cut, and ear-rings and brooches were made. These jewels were, at one time, expensive. The finest rose-tinted coral was valued at six hundred dollars an ounce. And in those days, when coral ornaments were so popular, there were at Algeria alone, engaged in coral fisheries, more than three thousand men.



Sprig of Tree-coral Enlarged.

Now something very strange has happened, and coral jewelry is worth scarcely any thing. Men have invented to take its place something which is a perfect imitation of both ivory and coral. They call it celluloid. It is made of cotton melted with chemicals and pressed into bars or thin sheets, and often colored with attractive tints. Of it are formed useful articles, such as knife handles and eye-glass frames, and various other things used for ornament. This new cotton jewelry has destroyed the old-time precious value of coral.

For a long time even learned men believed coral to be a plant. After closer examination they concluded

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that it was part plant and part animal. Still later coral was declared to be manufactured by insects; and many people at the present time speak of the "coral insect."

Coral is not a plant, nor is it an animal-plant. It is not manufactured by an insect or by any other animal. The living coral, as it is found in the sea, is an animal, and the dead coral in the necklace is a part of the skeleton of a once living coral. Here, then, is an animal a little like the sponge. It is stationary, or fixed to a particular place. It is a little higher grade of animal than the sponge; for, while it has no eyes, ears, nose, or legs, it has a simple mouth, a stomach, and something like feet, all of which the sponge does not possess.

The preceding illustration presents an object quite like a flower. It is a sprig of a kind of coral that branches out like a tree. No wonder people once thought the coral a plant. The petals or leaves of the flower, however, are the feelers or feeders of the animal. They are called tentacles. They have also been regarded as feet; and because there are many of them the animal was named a polyp, which means many-footed. Some kinds of polyps are produced from eggs, and for a while swim about.

The hole in the middle of the flower is the mouth. The petal-like tentacles move; and, when the proper food floats within reach, they grasp it and turn it into the mouth. From the mouth the food passes into the stomach, from which the nourishment is sent to every part of the polyp, while the useless matter is thrown out again at the mouth. When danger approaches,

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the tentacles fold in like the petals of a morning-glory, and close the mouth.

From the food which it takes, the soft part of the polyp is grown, and the hard part, or coral, is produced precisely as our flesh and bones are made from the things we eat. Only, in the case of the coral animal, too much of the stony bone is produced, and the living polyp is constantly growing up, and leaving the hard skeleton behind as a dead stem. A bud puts forth near the base of the polyp, and soon another animal blossoms out with petals or tentacles.

Red Coral Magnified.

So the budding and blossoming of these flower-animals goes on until many polyps, together with the dead stems of coral that support them, make a branch like the twig of a tree; or they crowd into a clump like a half-round stone, or a plum-pudding. One of these clump-like corals covers its surface with starry flower forms. Another appears like a round mass of human brains, and is called brain-coral.

PART 2.

How the beautiful corals of the Mediterranean Sea get their delicate pink, and rich, red tints, can not be known, as no one can tell how roses acquire their charming colors. By growing stems or skeletons of such fine texture and attractive hues, coral polyps may

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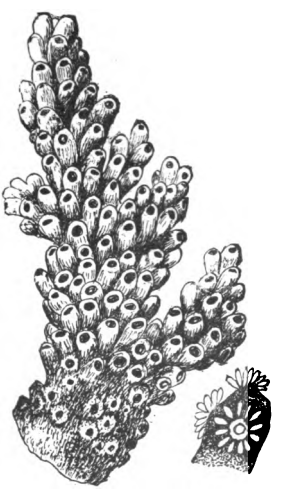
be justly called jewelers of the sea. But some kinds of coral animals do even a greater thing than to prepare their bodies to adorn a maiden's neck; they pile their skeletons in such vast heaps and so high, that islands are formed upon which trees grow, and animals, and even men, live. The Bermuda Islands in the Atlantic are raised on coral beds; and coral reefs are thrown out around the Florida coasts. The most interesting of coral islands are in the Pacific Ocean.



Reef-coral and Polyp.

The island builders, though too coarse and dull in their hard parts to answer for ornaments, are none the less beautiful in their forms. They live in tropical waters which never grow colder than summer warmth. They can not live in a depth of water greater than about one hundred and eighty feet. How, then, can they rear islands from the bottom of the sea?

Geography tells us that on the sea-bottom rest hills and mountains like the elevations which rise on the dry land. Some of these mountains are very lofty, and upon them are caught and gathered immense quantities of dead shells, and rubbish that floats in the ocean. In this way these mountains lift their heads higher and higher; and when one of them comes within two hundred feet of the surface, the coral polyps begin to fasten upon it, and to make it their home.

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Here they live and multiply, fed, like the sponge, by the surging waters; and they climb up on the ever dying skeletons of those that have lived before them, until they reach the surface. All this time, which must be a very great many years, the dashing of the water has constantly broken and crumbled the coral, so that the holes and cracks have been filled, and the wall is solid.

The little flower-animals, some of which are exceedingly small, love to throw out their petal-tentacles in the free, rushing water, where their food is most abundant. This leads them to crowd to the edge of the island, so that when their work, which is called a reef, reaches the surface of the water, it is in the shape of a ring or a horseshoe. In the middle of the ring is a quiet lake, called a lagoon.

When the reef rises near to the surface of the water, the corals begin a rough experience. Then they crumble and break off by the force of the waves that dash over them, and are heaped up above the level of the water. The waves grind the surface into soil. Seeds are wafted from far distant shores and find this soil. Trees and flowers grow; and could you ascend with the eagle and look down, you would see this coral reef lying like a leafy wreath on the bosom of the ocean, beautiful, strong, but made of skeletons.

Somehow birds find these lonely coral islands of the Pacific. On one of them, where no human beings dwell, Professor Dana, of Yale, found multitudes of birds who had no fear of man. No hunters with noisy guns had ever disturbed their peace. No heartless boys had broken their eggs or snatched away their

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young. He plucked them from the branches as one picks fruit. "And many a songster," he says, "lost a tail-feather as it sat perched upon a branch, apparently unconscious that the world contained an enemy."

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4. AMONG THE SHELLS.

FEW eyes that read these lines have never seen shells. They abound in nearly all waters and in the moist places of the land. The surf of the ocean and the waves of the lakes wash them upon the beach. They lie on the bottoms of ponds and rivers, hide in gutters and gardens, and show their white whorls by the roadside. Some of the great rocks are made of myriads of minute shells that once covered soft, living animals.

If those who live in the crowded city have never seen these creatures in their natural haunts, they may find them in temporary boarding places. In some eating-houses there are at certain seasons large piles of oysters dripping with melting ice. These are usually alive until they are forced open. The half shell with its white lining and black center-spot may be easily obtained. The pearl-lined clam shells have often served little girls for dishes, as they served savages thousands of years ago.

Then there are pearl buttons, knife handles, and card-cases in show-windows, and jewelry set with rare pearls glistening in show-cases. All these may be seen and enjoyed without cost. Who ever stops

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to think that they are somehow related to the oyster? Yes, these pretty objects in the show-case have come from shell-animals, the story of whose birth and life is well worth reading.

Shells for Toy Dishes.

To make the story more real and impressive, get some shells and study them. You may play with them and yet know little about them. I have seen little girls on the clean beach of the lake shore gathering with

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delight the small, conical shells which they are taught to call periwinkles. Are they periwinkles? Quite different from them are the periwinkles described by Charles Dickens in some of his stories. These are shell-animals which poor people gather at the salt water, and after cooking them, pick out the meat with a crooked pin.

It would be absurd to say that boys in the country, especially if they are near creeks or rivers, can not find fresh-water clams or mussels. A little wading in shallow water tempered by the sun may be required; but wading is not a great trial to the average boy. Snails anybody may find. Empty snail shells abound, which may be examined without and within to see how curiously they are wrought. Living snails may be captured in their hiding places.

With these shell-animals in hand, something may be learned. The oyster and the sea-clam will not perform before their captors, they are so shy. With a strong knife, however, they may be easily opened, if one knows how to do it. The fresh-water clam, if laid in water, will probably open its shell. The snail, when placed in a shallow dish and surrounded by tepid water, will come out of its twisted house.

Something common to all these animals may now be learned; namely, they live in hard shells and their bodies are entirely soft. A good way to prove that clams and oysters are soft is to eat them. They could not slip so easily over the tongue if they had bones. Now for these, and for all their soft, shell-covered cousins, we have a convenient word. They are called mollusks. This is a good name for soft things, you

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will say, when you remember that when a hard piece of leather or a rough temper is softened, it is said to be mollified.

Something further must be observed. The shells of the fresh-water clam, the salt-water clam, and the oyster open like a book with a hinge at its back. Break the hinge and there are two shells nearly alike. The snail shell can not be opened in this way. It is single, and looks as if it had been whirled or twisted.

It is plain that, besides protecting them against violence, these shells are designed in part to shut the water out and to shut the soft animals, or mollusks, in. Opening and closing perfectly tight, they act like the valves of a pump. They are, therefore, called valves. The clam, mussel, and oyster, having two shells, are called bi-valves. The snail and its kin, having but one shell, are called uni-valves. There is a long list of shell animals that are clam-like, and a long and brilliant one that are snail-like.

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5. THE CLAM.

About the year 1626, John Smith, the founder of Virginia and the author of the charming story of Pocahontas, wrote a book about his adopted country. In this book he describes the natural attractions of Virginia; and among other good things, he mentions the mollusk which is the subject of this chapter. "You shall scarce find," says he, "any bay or shallow

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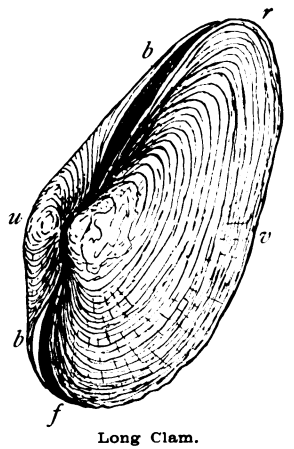
shore, or cove of sand, where you may not take many clamps." This shows that the clam was once called a clamp—an appropriate name, as we shall see.

The long clam and the round clam are those which John Smith referred to. Sometimes these animals may be found with their valves open. In this condition, should a finger be inserted into the opening, the two valves of the shell will instantly close; and if the finger is caught, its owner will know by experience that the clam is a clamp—a very close pinching clamp. Oysters are still more severe pinchers; hence they might also have been named clamps.



Long Clam.

To speak intelligently of the clam, its various parts must be named. The two half shells have already been called valves. Looking at the figure, the thick edge of the closed shell is the back (*b*). Each of the knobs on the back is called an umbo; together they are called umbones. Between the umbones on the back is the hinge. The sharp edge is the ventral edge (*v*). The large end of the whole shell is the front end (*f*); and the smaller end is the rear end (*r*). Holding the shell with its back up and the rear end toward you, the valve on the right-hand side is the right valve, and the other is the left valve. The largest half shell of the oyster is always the left valve, and lies downward.

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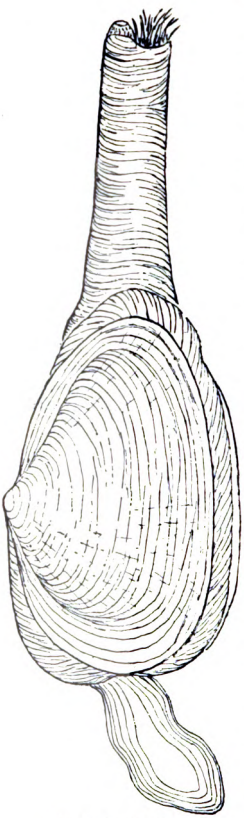
The long clam burrows in the sand, as John Smith intimated. How a shell can do such work could never be guessed if it were always found closed. Here then is a picture of the clam in action precisely as it works in the sand. Its front end is down, its rear end is up. But what is the long thing sticking up, and the shorter thing sticking down? The former is called the neck, and the latter the foot. Leaving the neck to be described further on, let us look at this foot.



Clam in Action.

A remarkable member is the foot. It never walks. It only digs; and it digs so rapidly, that one trying to catch this clam with a hoe must work briskly, or the foot will bore its hole in the sand faster than the hoe can uncover it. The fresh-water clam, or mussel, uses its foot for furrowing or plowing the bottom, but never for burrowing. Besides acting as a spade or auger, this foot carries the ear of the clam. At the slightest noise, the foot and neck are drawn in, and the shell is closed. There is another and still stranger thing about the clam's foot. It is close by the brains of the animal. Therefore Rev. Mr. Lockwood pleasantly says of the long clam's brother,

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the fresh-water mussel, or river-clam, "the mussel's brain is at the base of the understanding, that is, exactly under the foot."

To understand the clam animal, we must look within its shell. This is opened by running a knife-blade between the valves. How monkeys and apes on the wild coast open them without knives, we are not informed. The ancients tell a story of monkeys watching the clam or oyster until it opened itself, and then inserting a little stone to prevent its closing.

The knife, when used for this purpose, must pass within, and along the back, and cut two tough straps that hold the valves together. Then the shell will open on its hinge, and the two valves will lie back like the two covers of a book. Now we have the book opened, (page 31), and we must see what it contains.

Laying aside the right cover or valve, here is the soft animal lying on its bed of pearl in the left valve. The first thing to notice is a slippery, filmy cloak which wraps the animal as a water-proof sometimes wraps a school-girl. This leathery cloak is called the mantle. In its edge (*e*) is the sense of feeling; quite likely, also, the sense of sight.

Lay back the mantle, and there is exposed the foot (*f*) now drawn in. At the rear end is the long, extended neck which includes two tubes, or siphons. The siphons of the fresh-water clam are not joined, and extend at different points in the shell. Through the lower tube (*i*) the water flows in to feed the clam. Through the upper tube (*o*) the same water passes out after the animal has used the food it contains.

Those who dig for clams on the sea coast, find out

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what this siphon is for. Often the active little mollusk, as it burrows away from the hoe, throws a stream of water into the face of the digger.

PART 2.

HUNT around now for the mouth. You might expect it to be near the end of the neck, where most animals have their mouths. But no; it is at the opposite end of the clam, not far from the foot. It is only an opening (*m*). The clam has no teeth, no tongue, in fact no head. Away up under the hinge is its heart (*h*). Its food consists of animals and plants floating in the water. These are invisible except through the microscope.

The water that enters by the inflowing siphon (*i*) carries this food to the mouth (*m*). As the water, which carries air as well as food, flows toward the mouth, it passes over the gills (*g*) by which the clam breathes; for clams must breathe. There are four of these gills, and they are filled with small, thin tubes into which the cold, white blood of the clam flows, and takes the air from the water on its way to the mouth.

The gills do for the clam what the lungs do for the reader, as is simply explained in the little book entitled, "The House I Live In." The smelling nerve of the clam is not far from where the siphon joins the gills (*n*). It is used to detect the character of the water which flows to the gills.

It is rather strange to find the mouth of an animal at one end, and the neck and nose at the opposite end;

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but any absurd thing may be expected in a creature whose ears and brains are about its foot. Still another fact is brought to light through the microscope. For both air and food, the clam must have an almost constant stream of water running into it; and to carry away the food it rejects, and the impurities of its blood, it must have a steady stream going out.

To keep the water moving both in and out, the inside of the siphon is covered with minute hairs which, by constant motion like little paddles, pull and push

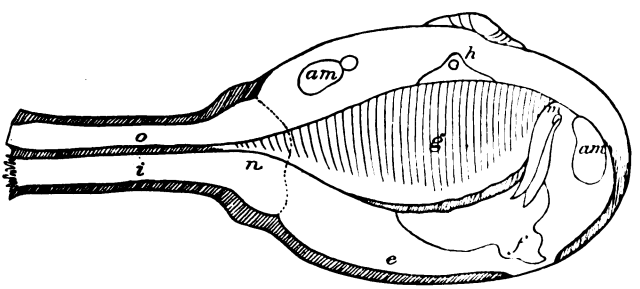

Fig. I. Showing the Clam within the Shell.

the water along. The gills are covered by these hair paddles. The mouth is surrounded by them, and all together they keep the water in motion. In the outflowing siphon the same kind of hairs work the other way, and move the waste water out.

What now is meant by the saying, "As happy as a clam"? Like the sponge, the clam never goes in search of food. The food must come to the clam. When the ocean tide is out, the clam is left in its hole on the dry beach. It grows hungry during the six hours of low tide. Up near to the top of the hole it

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rises, and stretches out its siphon for the first ripple of food-laden water, as a child holds out its hand for bread.

Very likely, too, it puts out its foot with a rude ear on it, to catch the music of the advancing surf as the tide creeps up the beach. By and by it comes—the richly freighted water—with the joy of fresh air and fresh food in every drop; and the clam is happy. The entire proverb, therefore, is, "As happy as a clam in *high water.*"

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6. THE CLAM'S SHELL.

THE shell is an admirable house for a body so soft, without a bone in it, and absolutely defenseless. So strong is it that a heavy weight will not crush it. So hard is it that the horny bill of a fish-hawk can not penetrate it. When they want to break the shell of a mollusk, birds are wont to take it in the beak, and, flying to a considerable height, to let it fall upon a rock. Besides being strong and tight when closed, the shell is lined with a pearly and perfectly smooth surface for the delicate mantle to lie upon.

It is now known how the clam's shell grows. The same sea-water that furnishes lime for the skeleton of the coral, carries lime for the shell of the mollusk. The river and the creek also contain this material. It might be supposed that the shell would somehow grow, and then the tender mollusk would in some way be born within it. The contrary, however, is true. The

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mollusk is hatched from an egg, and is surrounded by its mantle. This mantle has the wonderful power of taking or secreting lime from the water and turning it into hard shell.

The shell begins to grow at the hinge, and increases as fast as the animal grows. The manner of this growth is like that of shingling a roof backwards from the ridge to the eaves. First, one little circular layer of shell is made at the hinge. Then as the animal grows, another still larger layer or shingle pushes out from under the first. And so on, as shown in Fig. 3, each bit of growth leaving its definite line on the outside of the shell, while the inside is spread over with a polished coat of pearl.

This is the place to speak of the way in which the clam opens and closes its shell. Suppose, as in the figures, two shells cut through both valves so as to take a cross slice or section from each. The pieces will then show the way in which the layers of growth have been added, each one extending from under the preceding one. They also show the contrivances for opening and closing the shell in the salt-water clam and in the fresh-water clam, or mussel.

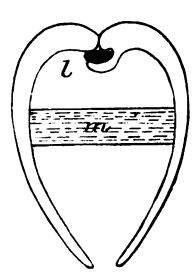

Fig. 2.
Section of Clam.

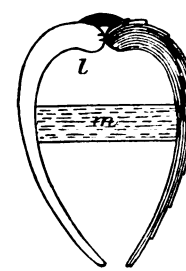

Fig. 3.
Section of Mussel.

If you put a piece of rubber inside a book close to its hinge, the book may be closed by pressing the covers together, but it will not stay shut, because the

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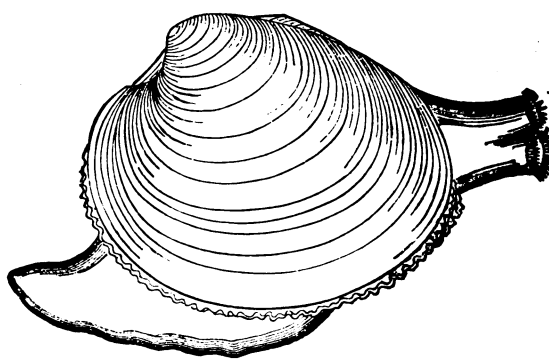
rubber is elastic. Something like such a piece of rubber is a ligament under the hinge of the salt-water clam, as shown in Figure 2 (*l*). If you open a book and fasten the covers open by a rubber strap running over the outside of the back, you can only close it by force, and then it will open again as soon as you let it go. In the same way an elastic ligament on the outside of the fresh-water clam (Fig. 3 *l*) draws the valves open. In the salt-water clam the ligament pushes the valves open, and in the fresh-water clam the ligament pulls the valves open.



Little Neck Clam.

This is just what the clams want to make them happy—to be kept open without effort, so that the nourishing water may always flow in. To close their valves they must put forth an effort; and this is the way they work. Inside the shell two strong muscles pass from one valve to the other. One of these muscles (*m*) is shown in each of the two figures just now before us. It is called an adductor muscle, adductor

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meaning that which brings to. In the figure on page 31, the places of both the adductor muscles of the clam are indicated (*am*).

It is easy to see why, when a clam is opened with a knife, the knife must be passed along the valve near the front and back; this is to cut the two adductor muscles. Even with one of these muscles the clam will close its shell, as an omnibus driver shuts the door of his carriage by his foot-strap.

A brother of the long clam is the round clam, sometimes called hard-shell, or little-neck-clam. Its awkward foot is pushing out below and in front. It does not dig, but hitches along by means of this foot. Its short neck, or siphons, stretch out behind and above, one with a fringe of hairs to paddle the water in, and the other with the same kind of hairs to paddle the water out.

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7. SOME USES OF CLAMS.

THE largest of all shell animals is the giant-clam. It is produced in tropical seas, and particularly in the region of Sumatra. The famous Swedish naturalist Linnæus, who lived more than a hundred years ago, describes one of these clams which weighed four hundred and ninety-eight pounds. The mollusk within the shell furnished a day's food for one hundred and twenty men. So great was the strength of its muscle, that by suddenly closing its valves it cut the cable of a ship in two.

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The giant-clam is valuable to the South Sea Islanders. Besides providing an important part of their food, its valves are of great practical use. On some of these islands stones are unknown. Here the natives can not make stone weapons and implements as did the savages of more favored regions; hence the giant-clam shell is a great blessing to them. From it they make their knives, hammers, axes, and weapons of war.

The giant-clam shell is convenient as a receptacle. How immense it is! Sir Joseph Banks, who accompanied Capt. Cook on his voyage in 1768, possessed a monster shell, one valve of which weighed two hundred and twenty-two pounds, while the other valve weighed two hundred and eighty-five pounds.

This shell is lined with a beautiful, white, pearl coating; and when the rough exterior is removed, the valve is something quite ornamental. Many years ago a giant-clam shell was presented to the Church of St. Sulpice in Paris. The valves of this shell are used to contain the holy water.

A pleasant use of clams is observed in an old custom called the "New England Clam Bake." It appears that the savages who inhabited New England from time immemorial, were accustomed to gather at the sea-shore for great clam feasts. Both clams and oysters, as any one might conclude, cease to hold their valves together the moment they begin to be cooked. Therefore it was easy for Indians, who had no knives, to open their shell fish by heat.

The modern clam bake, which is observed at several points on the coast, but particularly on the coast of

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Rhode Island, is quite closely copied from the feast of the Indians. These natives were accustomed, on such occasions, to invite to the assembly kings, chiefs, and other dignitaries. In this respect, as well as in the manner of roasting the bivalves, the custom of to-day follows that of the savages. The clam bake brings

Indian Clam Bake.

together a large party of people, and quite often is held in honor of distinguished persons, much like the barbecue of the South, at which great people and small people come together to feast upon ox, sheep, and shote, roasted whole.

And this is the way the clam bake proceeds. A

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circular floor of stones, perhaps ten feet in diameter, is laid on the beach. On this a fire is kindled and fed until the stones are red hot. A layer of sea-weed is spread on the stones, and upon this clams are placed to a depth of two or three inches. Over these is scattered another cover of sea-weed. Then comes a layer of green corn in the husk, with potatoes and other vegetables. After more sea-weed, dressed chickens are added to the pile, and are often followed in the same manner by oysters and lobsters. To make the cooking more thorough and toothsome, a canvas or tarpaulin, is stretched over the steaming heap.

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8. THE OYSTER.

WHEN the oyster is laid open and placed by the side of the clam or mussel, it is at once seen that the two are in many points alike, and deserve to be called cousins. The shell of the oyster is bivalve—a book with two covers—and has the elastic ligament inside the hinge to spring it open. Its shingly growth is readily observed, but it is a rough, ugly looking shell. It grows narrow near the hinge, and the left valve, from holding fast to the sea-bottom, is much larger than the right valve.

On the inside of the clam shell were pointed out two spots, one at each end near the back, where were attached the two strong adductor muscles which close the shell. On the white lining of the oyster shell but one such spot appears. It is of a dark purple color,

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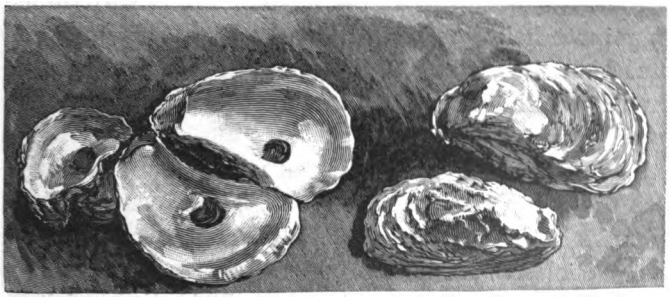
and is near the middle of the valve. The oyster has but one adductor muscle, and this is an immensely strong one. It joins the valves where the round purple spots appear.

The oyster animal is nearly like the clam animal. It is entirely soft and without bones—a true mollusk. The same kind of a slippery mantle lies between it and the inside of the shell, though this mantle does not completely envelop the mollusk. The oyster has no



Oyster Shells.

foot. What does it want of a foot? It spends nearly its whole life fastened to the bottom. Nature is very economical, and would not bestow a foot where one can not be used.

When the valves are open, the mantle sometimes stretches down and throws its fringe beyond the lower or ventral edge of the shell. In the border of the mantle is the sense of touch; and here are the eyes, if there are any; and the ears are not far off. Oysters close their valves at the slightest noise; and a brush of the hand over the water where they lie, when the light is strong, will produce the same effect. Along

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the lower part of the shell lie the four gill-plates with which the animal breathes, or takes air from the water.

Above the gills is the adductor muscle. Try your fork in it and see how hard it is. The oysterman must cut this muscle before he can pry the valves apart. He calls it the heart, but it is not a heart. This latter organ, however, lies near by. It beats like a human heart, only much slower—from one to fifteen throbs in a minute. At the front end of the gills is the mouth of this headless animal. It is surrounded by minute hairs, or cilia. When the oyster is open and breathing, the cilia all along the gills and about the mouth are in motion, pushing the water into the mouth.

The oyster has a small friend which, until recently, was thought to be an enemy. It is the oyster crab, a greenish little creature when alive, but becoming red when cooked. It is a dainty morsel, and was so regarded by George Washington. This little visitor, about a half inch in diameter, walks in and out of the oyster's house at pleasure; for strangely enough, the door seems to be always open to her. Why should the oyster, usually so shy, admit this intruder?

Oyster Crab.

It is found that the crab is a messmate of the oyster, and comes in to take her meals with her hostess, Mrs. Oyster. The inflowing water which feeds the oyster feeds the crab. Then it is a very nice thing for Crab to be inclosed in oyster castle, when hunted by her fierce enemies.

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The oyster's food, like the clam's, includes minute animals and plants visible only by the aid of the microscope. The same water which brings these contains larger bodies which the oyster can not eat. This coarser fare suits little Crab, who devours it in peace and joy, dropping many fine crumbs which its hostess relishes. So the presence of the crab is a benefit to the oyster; and when it entertains a crab, the oyster is likely to be plump and happy.

PART 2.

To many people the oyster appears most interesting when it lies on the half shell, or when it floats in a milk-white stew, or when it gives forth the pleasant odors of the frying pan. Thousands of years ago, savage men found that oysters were good for food. On the shore of the ocean, they have left immense heaps of shells to testify to their fondness for these delicious mollusks. At one point, on the coast of Maine, lies a pile of these shells measuring eight million cubic feet. Oysters in those far off years, as these remains show, were twice as large as those of the present time. One of them has been found which measured fifteen inches in length.

The American people of to-day are great eaters of oysters. In a single year, on our coasts, there are taken and sold more than twenty-two million bushels of these bivalves, making over six billions three hundred millions of oysters, by count. Seventy-five millions are exported to foreign countries, leaving more than six billions to be eaten by Americans—which figures

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an average of at least a hundred oysters to each man, woman, and child. This does not mean that each gets his hundred.

How so many are produced and gathered will be an interesting question to answer. The oyster is ready to be eaten when it is about four or five years old. Like

Fig. 4.

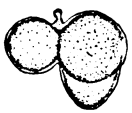

Fig. 5.

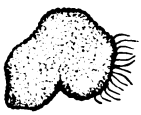

Fig. 6.

Growth of Oyster from the Egg.

Fig. 7.

the chicken and the clam, it comes from an egg. The mother oyster between the months of May and September produces over nine millions of eggs. After lying in the folds of the mantle for a while, these eggs are sent into the water where the wee things in them at once begin to grow.

The perfect egg, greatly magnified in the illustration, is a five hundredth part of an inch in diameter (Fig. 4). When it is three hours old it assumes a different shape (Fig. 5). When it begins to swim it is called a "spat" (Fig. 6). It swims by the motion of its cilia or hairs. When it is nearly ready to settle upon the bottom (Fig. 7), the shell has begun to grow from its mantle, and the cilia about where its head would be, if it were fortunate enough to have a head, are the paddles by which it scuds about.

Within six days from the time it left its mother's mantle, the spat will find a congenial place on the bottom, fasten itself to an old oyster shell or an old boot, and there remain for the rest of its life. Although such

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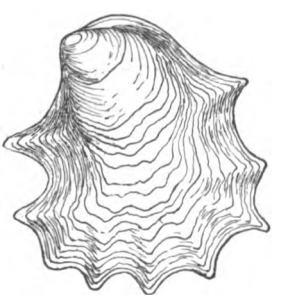
an immense number of eggs is produced by a single oyster, it is believed that not one in a million of eggs ever comes to a full-grown mollusk. A single fish will devour a million of eggs at a mouthful, to say nothing of the poor, innocent little spats that make nice fish-food. The mother herself swallows eggs without knowing it. Still there are enough spats saved to make our six billions of oysters.

In their natural state, oysters live and grow in beds. These beds can only flourish in small bays, coves, and inlets of the sea coast, protected from the fury of the ocean waves and from storms. The water must be neither too cold nor too warm, and must contain an abundance of microscopical food. The places where spats are cradled and reared, therefore, are necessarily few. There are two kinds of oyster beds, the natural and the artificial. In the natural beds, where the animals are left to themselves, they grow in heaps. The spats fasten to the older oysters, and in separating them there is much waste.



Oyster Seed.

The artificial beds are those in which spats are collected, and in which young oysters called "seeds" are transplanted and grow for market. During the spawning season, near where the eggs or spawn of old oysters are wont to drift, a bed is prepared for collecting the spats. Oyster shells are usually thrown on the bottom for the spats to fasten to, though the little

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swimmers will stick to a stone or to a piece of wood or crockery. Forty of them will cleave to one oyster shell. When they are as large as a quarter of a dollar they are termed "seeds" or "blisters."

They may now be raked up and carried to empty beds where they are scattered at the rate of a bushel to about forty square feet. Here they grow for four or five years, when they are ready for market.

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9. OYSTER-CATCHING.

OYSTERS are caught by a bird called the oyster catcher, by star-fish, soft crabs, drill-fish, and conchs. All these plunder for their own benefit. Some of them, as the star-fish, are very troublesome to the growing beds, and the oystermen are accustomed, at certain times of the year, to rake over the bed and capture a multitude of these enemies.

Leaving all the remaining enemies mentioned to be looked up in the Cyclopædia, let us attend to one of them, and see how a little sound knowledge is useful in any kind of business. The star-fish, which belongs to a lower branch of animals than the oyster, has its mouth in the center from which the five arms radiate. The arms are made of limestone sections joined by a tough membrane, so that they can bend and grasp the prey. They are also covered with sharp spines, and on this account are not themselves a pleasant prey for other animals.

The star-fish moves by filling ever so many little

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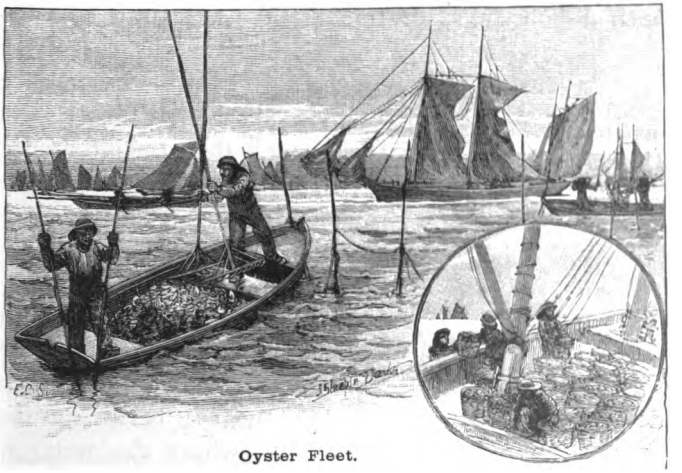
tubes attached to its rays or arms. By placing the tubes upon any surface and drawing the water from them, they are made to stick fast, by suction. The animal sometimes grows to a diameter of more than two feet. He grasps the oyster in his five arms, and by the suckers around his mouth breaks the thin edge



Oyster Fleet.

of the shell. Then he runs into the shell the end of his stomach, and sucks away all that part of the oyster which he most relishes. The star-fish is to be commended for his good taste.

Some years ago, oystermen were accustomed to catch these depredators with tongs and dredges, and after filling their boats, to break the star-fish in pieces and throw the pieces overboard into the water. They did not then know what they have since learned,—that many of the pieces of a star-fish will grow into com-

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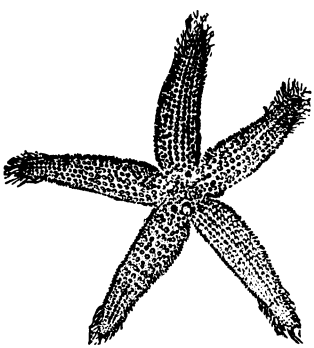
plete animals. So that by dividing these mischievous creatures they were only multiplying them.

The business of taking oysters for human use commences in September, when the spawning is over and the animals are plump. A sloop is brought to anchor over the bed, and small boats containing men are sent out in various directions. First, the oysters are taken with double rakes or tongs, and are thrown into the little boats which convey them to the sloop. When the rakes and tongs have done all they can, a dredge is thrown out from the sloop and dragged over the bottom until the bed is thoroughly cleaned.



Star-fish.

The sloop, having been loaded with from two hundred to eight hundred bushels of oysters, is run into the mouth of some river or creek, where the water is partly fresh, to "give the oysters a drink," as the fishermen say. Here the load is thrown overboard in shallow water, when the bivalves open, the water runs in, and they get their "drink." In this way, it is claimed, they cleanse themselves from the rubbish of the sea, get rid of their salt, become white, and appear suddenly to fatten. The fattening, however, is only a temporary puffing up with water.

When finally raised from their temporary resting place, they are disposed of in different ways. Many families near at hand purchase each from ten to twenty

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bushels, which are packed away with sea-weed in the cellar for winter use. Those that remain till spring are quite likely to be alive and well. Large quantities of oysters in the shell are shipped to Europe.

For use in the interior of the country, the shells are packed in barrels, the large valve down so as to retain all the liquor of the animal. A large business is carried on in "raw oysters," or those which are taken from the shells and canned. The opening of oysters is something of a trade in itself. An expert opener will take out thirty thousand oysters in a day. The raw oysters are separated according to size into "mediums," "standards," and "selects," and are packed in tin quart cans, or in gallon kegs.

The New York oysters bear many fancy names. "Saddle-rocks" came originally from a reef of that name on the north shore of Long Island. Twenty-five of them have been known to fill a bushel. The bed, however, was exhausted more than forty years ago, and now any good, large oyster may be called a "saddle-rock." "Blue Points," which are small but of fine flavor, and sought for eating on the half-shell, are from shallow bays along the southern shore of Long Island. "Shrewsburys" grow at the mouth of a river of that name near Sandy Hook.

The oysters of the Pacific coast are exceedingly small, and are served in restaurants by the hundred or half hundred. A Californian visiting New York stepped into an eating-house and ordered a hundred fried oysters. He was surprised when he saw spread before him a full hundred Shrewsburys, a dozen of which make a hearty meal.

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10. PEARLS AND PEARL-MAKERS.

In the law book of the ancient Hebrews, which is called the Talmud, is found a story which illustrates the value of the pearl.

When Abraham came near to Egypt, he locked Sarah his wife in a chest, that none might behold her beauty. But when he came to the place of paying customs, the officer said to him, "Pay custom." And he said, "I will pay the custom." They said to him, "Thou carriest clothes;" and he said, "I will pay for clothes." Then they said, "Thou carriest gold;" and he replied, "I will pay for gold."

On this they cried, "Surely thou bearest fine silk;" and he answered, "I will pay custom for the finest silk." Then they said, "Surely it must be pearls that thou takest with thee;" and he only answered, "I will pay for pearls." As they knew nothing more valuable than pearls, they demanded that the box should be opened, in order that they might determine what concealed treasure it was for which the owner was willing to pay custom sufficient for fine pearls.

And the box was opened, when they found that nothing in the opinion of Abraham was too costly or pure to be compared with his wife Sarah.

It is a singular fact that pearls, regarded by some as more beautiful than diamonds, are made by certain kinds of clams and oysters. These are called pearl mussels and pearl oysters. The lining of these shells, called nacre (nāker) or mother-of-pearl, is itself beautiful. The mantle of the mollusk makes the shell. The fringe of

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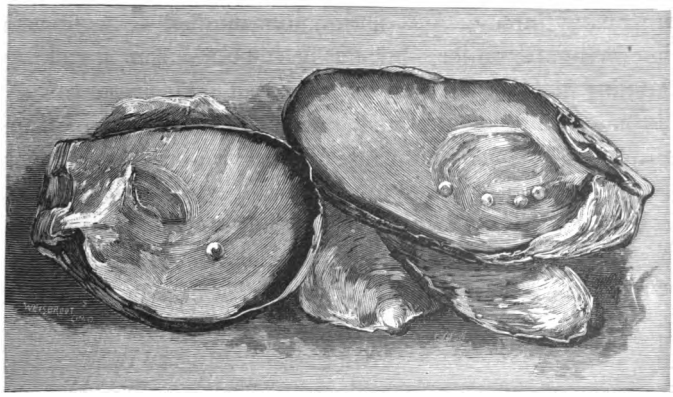
the mantle produces the outside, and from the body of the mantle grows the rainbow lining. This wonderful mantle, also, makes the pearl.

For a long time it was supposed that the pearl mussel and pearl oyster mold their gems about grains of sand, or produce them when diseased. It is now the opinion that some little animal gets into the mussel



Pearl Oysters.

or oyster and irritates the mantle. There is then let out of the mantle a small sphere or drop of nacre which increases layer by layer, until it reaches the size, it may be, of a large bean. Both the pearl oyster of the ocean and certain species of the fresh-water mussel occasionally make pearls.

One reason for the invasion of Britain by the Romans was said to be the attraction of its pearl fisheries. In Irish and Scotch rivers large numbers of mussels have been found containing pearls. In the year 1865 these rivers yielded sixty thousand dollars' worth.

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The Queen paid two hundred dollars for a Scotch pearl. It is also said that one of the pearls that adorn the royal crown of Great Britain was found by the waiting lady of Catharine, the wife of Henry VIII. She was fishing, and either hooked up or picked up the mussel which bore the gem.

In 1857, great excitement was created by the discovery of a very large pearl in Notch Brook near Paterson, New Jersey. A shoemaker named Howell was the fortunate finder, but he had ruined the jewel by cooking the mussel that contained it. A carpenter of the name of Quackenbush, heard of this good fortune and took to pearl-hunting. After wading about for several days, he picked up a mussel containing a pearl five eighths of an inch in diameter, for which a jeweler in New York paid a thousand dollars. It was afterward sold in Paris for five thousand dollars.

PART 2.

Rosy and green pearls, and those of a fine luster, are preferred. Pearls are classed as clear, half-clear, and sand-pearls. In China, mussels are kept in acquariums and are made to manufacture pearl ornaments. The natives make of tin foil little, flat, stamped images for idols. These they insert within the valves of a living mussel, where they remain for two or three months. At the end of this period the images, still retaining their original features, are covered with a coating of pearl, and are then worn as pendants.

The most valuable of the gems we are describing are taken from the pearl oyster, which lives in certain fa-

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vored places in the sea. The finest pearls are found near the islands of the Persian Gulf. Here the ancient Macedonians gathered many jewels. The largest fisheries are carried on at the island of Ceylon. The fishing grounds are in control of the British government. The best pearls are yielded by oysters four years old. It is said that an oyster containing a gem will die at seven, and the pearl, of course, will be lost.

The fishing season occurs early in the spring, and lasts about six weeks. During this time the shore of the island is whitened with the tents of native pearl-fishers. A group of boats, each containing ten men, reaches the oyster banks at sunrise. At the firing of a signal gun, the diving commences. The divers work in pairs. One remains in the boat holding a rope. This rope is fastened to the other, who dives; and to him, also, a sink-stone, weighing forty pounds, is attached.

The greatest danger to which the diver is exposed, is the shark, which has a passion for divers' flesh. To fight this monster, the man takes down with him spikes made of iron-wood. Before he is let down, his clothes are stripped from him by a sort of priest or shark-charmer, who performs over him some strange service. Should the shark, however, come to attack him, the diver does not depend upon the incantations of the charmer, but fights with his spikes and stirs up the mud to blind the shark.

When the gun fires again at noon, the fleet returns, and the oysters are divided into four heaps, of which one goes to the fishermen for their wages, and the remaining three are sold at auction. The shells are opened and the pearls are sorted by sifting them through

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Pearl Oyster Fishing.

Drilling Pearls.

baskets having different sized holes. Some of them are drilled with holes for beads. The most common size of fine oriental pearls is from one and a half to three times that of a pea.

The pearl which is nearest perfect is round or pear-shaped. It is free from speck or flaw, of delicate texture and clear, almost transparent white color, with a soft gloss and irridescence. The Shah or King of Persia, in 1633, paid for a single pearl sixty-five thousand dollars. This jewel had belonged to a Sultan who purchased it with three hundred pure-blood Arab horses.

The most beautiful pearl now known is kept in a museum at Moscow. It was taken more than fifty years ago and weighs ninety grains. The largest pearl in existence belongs to Mr. Beresford Hope, of London. This magnificent gem weighs three ounces, is four and a half inches in circumference, and is valued at sixty thousand dollars.

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II. THE SNAIL.

THE school-boy of three centuries ago must have been a very slow creeper, or else his school was entirely unattractive. Shakespeare, in describing the seven ages, says:

> "Then the whining school-boy, with his satchel
> And shining morning face, creeping like snail
> Unwillingly to school."

Probably there are no such boys in these days. But we have snails, and by studying them we may know at least one characteristic of the boy of three hundred years ago.

The snail deserves more notice than it has been accustomed to receive. It is far more intelligent than any animal before spoken of. It has been tamed, and trained to come out of its shell, when called. In Europe it is regarded as a nice article of food. In this country it has never been used very much for the table, although, in this respect, it is rapidly gaining friends.

The snail is like the clam and the oyster, in two general features. It has a soft body without a bone, and it has a hard shell to cover the body. It is a mollusk because it is soft; but it is not a bivalve, because its shell does not divide into two valves. It has but one shell, and is, therefore, a univalve. This shell, or one nearly like it, must be looked at a moment, and its different parts learned.

The figure is that of an Illinois pond snail. It is turned, coiled, or whirled into a spire like the point of a gimlet. Its general form is that of a cone. The

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cone is composed of whirls or *whorls*. The largest of these is the body whorl (*bw*). Those above the body are simply whorls which together form the spire (*sp*). The opening at the base (*m*) is the mouth, the edges of which roll back on either side. The name for each of these edges of the mouth is lip.

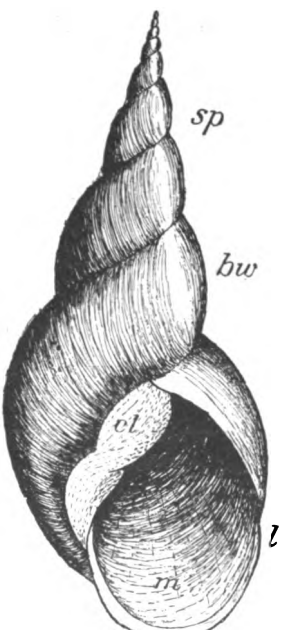

Fig. 8. Pond Snail Shell.

The lip on the right side of the mouth — in some of the snail's large relations a very broad lip—is known by its simple name. That on the left side is designated as the columella lip. Carefully break in, on one side, the body whorl of a common snail, and you will see a little column rising from the inside of this lip to the apex — like the column of a spiral staircase. This little column is the columella, and its outward fold is the columella lip. The lips of the snail's shell are short and roll out scarcely at all. The shell itself shows that it has grown by constant additions, or sections, which have left their lines on the outside.

Nothing could be more perfectly contrived for its uses than this shell. When the animal retires within it, the body must slip very easily up the spiral way toward the apex. And when it is out and slowly moving, what could be more compact and easily bal-

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anced on the snail's back than this cone with nearly all its weight at the base! If the shell breaks, the animal throws a sticky fluid across the fracture, and soon a horny patch has grown as good as new.

The snail is more complete in its formation than the oyster. The oyster has no foot. The snail has a foot running along on the under side of its body. The oyster has no head. The snail has a head. The organs of the oyster are scattered about—the mouth near the hinge, the feelers, ears, and eyes on the edge of the mantle.

Pond Snail.

The snail's senses are gathered in its head. The mouth, eyes, feelers, and smelling organs are there. The snail has a real mouth with hard jaws; and a long tongue like a ribbon, covered with teeth which work against the upper jaw and crunch the weeds it feeds upon. The oyster is water-breathing, the snail is air-breathing. It has a little sac which answers for lungs; and the pond snail, working on the water bottom, comes to the top occasionally, sets free the bubble of air it has used, takes a fresh bubble, and returns to its work in the water.

The snail has been slandered because it is slow. It is fast enough; faster than the oyster, which never moves from its seat. And then it goes as swiftly as it can, so that no one can charge it with being lazy. When, too, it is considered that this creeper has but

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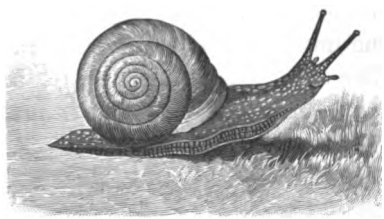
one foot, and that, when it moves, it must carry its house on its back, it must be pronounced a hero.

Snails have a period of remaining torpid, when they draw themselves within their shells, covering the mouth with a sticky liquid which hardens by exposure. Thus they remain, in temperate climates during the winter, and in torrid climates during the very hottest weather. Some of the snail's larger relations close the mouth of the shell with a cover attached to the foot. The cover fits close into the mouth.



Land Snail.

The shell of the pond snail, with its spire raised considerably above the body whorl, is easily distinguished from that of the land snail, whose spire is very short, and whose body whorl is very large. The mollusks themselves differ in some respects. The pond snail has two feelers or horns, the land snail has four,—two above and two below. The eyes of the pond snail are at the base of its feelers, while the eyes of the other are at the end of its upper feelers or horns.

Snails can live long without food. In 1846, a famous specimen was brought from Egypt and placed in the British Museum. It was supposed to be dead, but revived after it had lain four years without eating. There were reasons to believe that it was alive; warm water was applied and it appeared. Another one in this country, from Lower California, lived in confinement and fasted for six years.

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12. THE SNAIL'S GAY RELATIONS.

I HAVE seen
A curious child who dwelt upon a tract
Of inland ground, applying to his ear
The convolutions of a smooth-lipped shell;
To which, in silence hushed, his very soul
Listened intensely; for from within were heard
Murmurings, whereby the monitor expressed
Mysterious union with its native sea.

— *Wordsworth.*

VERY likely the child whom Wordsworth saw had in his hand one of those shells which are called porcelain shells, or cowries. I remember well the first time I placed one to my ear. I really thought, as the shell had come from the ocean, it had brought with it a little of the ocean roar confined in its convolutions or whorls. It destroys this little bubble of romance, to find that the hand bent into a cup and held to the ear produces nearly the same effect.

The cowry animal is essentially like the snail. The cowry shell is quite different from the snail shell in shape and appearance. It is almost precisely like a coffee berry. It is without the spire of the cone, and has only the body whorl, with an opening running its whole length, thus forming its mouth. Like most of the ornamental shell animals, the cowry has more of a foot than its sober little cousin the snail has; and attached to this foot is a trap-door which closes the mouth of the shell, when the mollusk retires into it.

Exquisitely beautiful are these cowries, covered with dark spots, and equal in finish to the finest porcelain.

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The wonder is that the shell is produced from the mantle of the mollusk; and the spots, or eyes, are painted by a coloring matter secreted by the mantle precisely where the spots occur on the shell. Cowries are of different sizes and shades. The mollusk is quite as beautiful as its shell.

You can not wonder that uncivilized peoples have a passion for ornamental shells. A small cowry found in the Pacific Ocean is used by African tribes for money. Great numbers of money cowries are shipped by England to Africa, where they are sold to the natives in exchange for their products. These shells are the common money of the natives of Bengal, Siam, and Hindostan.

The first settlers of this country found the Indians using shells for money. These natives cut the white and the black shells in pieces, and strung them on a cord or belt, which was then called wampum. The squaws tied shells to the shoes they wore when dancing, to produce a rattling, tinkling sound. The only piano the Indians had consisted of strings of shells hung loosely around their lodges, and played upon by the fingers of the wind. The ancient Athenians made use of shells for ballots, upon which they inscribed their votes. In the Friendly Islands the orange cowry is worn only by persons of the highest rank.

PART 2.

water has not seen the large, reddish conch shell? this country the farmers on the coast used this southern ment and horn to call their workmen to dinner. The

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Smooth-lipped Shell.

trumpet shell is another noisy one, with a long spire. Found in West India and Panama waters, the sailors call it an augur shell. This shell is supposed to have

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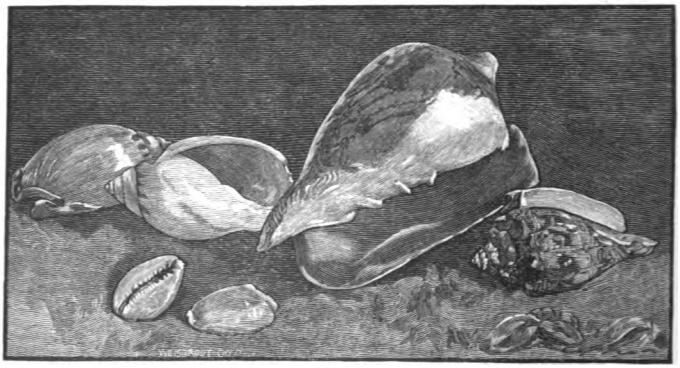
first suggested to uncivilized man the idea of the instrument called the trumpet. The spiny murex is the military horn of certain African tribes.

In ancient Palestine bee-keepers employed the conch to make a whistling or hissing noise to entice their bees. Says Isaiah: "And it shall come to pass that the Lord shall hiss for the fly that is in the uttermost parts of the rivers of Egypt, and for the bee that is in



Cassis. Money Cowries. | Group of Shells. | Voluta. Conch Shells.

the land of Assyria." With the trumpet shell the Italian herdsman calls his cattle, and the Welsh farmer wakes the silence of his mountain wilds.

Among the collections is seen a rough, though very attractive shell, covered with spines or horns. This is the murex. The mollusk to which it belongs is ferocious, and attacks other mollusks. The shell is that which was used by the ancient Syrians and Greeks in the preparation of the Tyrian purple. The story is that the purple coloring matter contained in the shell

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was first brought to notice by a dog, who broke a shell with his teeth, leaving the stain on his lips. With this purple the Babylonians dyed the robes they dressed their idols with; and with it Moses tinted the furniture of the tabernacle. Wool dyed with Tyrian purple sold, during the reign of the Emperor Augustus, for one hundred and eighty dollars a pound.

From the cassis shell some of the cheaper cameos employed in jewelry are cut. The delicate fineness and blush of the cameo stone make it valuable, but the cost is mainly in the cutting.

On account of their scarcity, and of the beautiful coverings worn by the snail's kin, they have sometimes commanded large prices. As late as 1865, rare cowries sold for two hundred dollars each. Cones, valued for fine polish and rich markings, brought from sixty to two hundred dollars. In 1876, the gay voluta, spotted with orange and white, sold for fifty dollars; before that date it had cost two hundred dollars.

Of what possible use to these tender inhabitants are the rich and gay colorings and luster of the whorls, or the delicate tints of the lips? These gorgeous clothes are, in their natural state, inclosed in a rough outside crust, which is no more handsome than the shuck of a cocoa-nut. Perhaps these beauties of shell grow to please human eyes. Perhaps they are designed to teach that what is good and beautiful in character lies beneath the surface. As Wordsworth again says:

> True beauty dwells in deep retreats,
> Whose veil is unremoved
> Till heart with heart in concord beats,
> And the lover is beloved.

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13. LIVING PINCHERS.

In most parts of the country, boys need no introduction to crawfish; and in the large city, or near the sea-coast, any one may at times see lobsters at the fish-market. Crawfish and lobsters are almost precisely alike. Indeed, the crawfish is sometimes called the fresh-water lobster. It is about five inches long, and swims near the bottom of rivers and ponds. The lobster is about ten inches long, and moves about in the shallow waters of the sea-coast.

To shake hands with either of these queer-looking creatures is not the most pleasant way of forming their acquaintance. Many a stranger has thought their grasp quite too affectionate. In fact, their grip is a pinch, and their hands, such as they have, are pinchers, and are armed with ugly teeth. Boys who have once been pinched have learned to pick them up by the back, so as to handle them without injury. It would be well to hold one in this way long enough to see how it is fitted for the battle of life—to get its food, and to fight its enemies.

The lobster and the crawfish have no true bones in their bodies. The body is divided into three main parts, called the head, the thorax or breastplate, and the abdomen. This last part is again made up of seven pieces or joints. The whole body is covered by a hard outside crust. The animals are, therefore, called crustaceans. The crust or shell is of a black or dark green color when the animal is alive. Those lobsters that lie quietly in the fish-market, are dead, and have been

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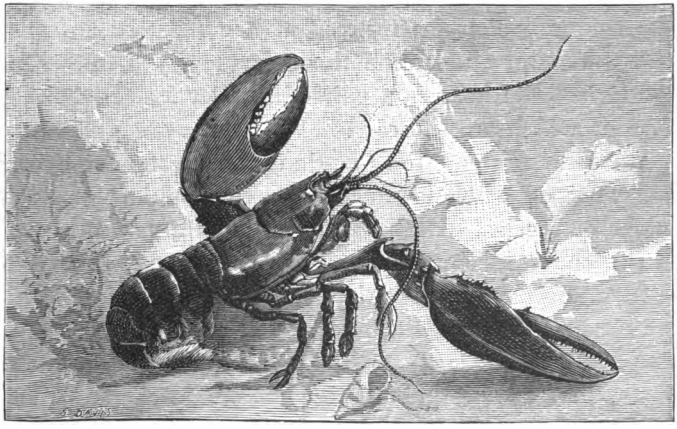
partly cooked. Cooking, you will observe, turns the color of the shell red.

This creature seems to have legs in abundance. It is a great improvement upon the snail that has no legs. Attached to the thorax are eight pairs of limbs, the first three pairs being used as jaws, and called foot-jaws; the next pair are the great claws; and the four pairs behind the claws are the walking legs. Six pairs of



American Lobster.

smaller limbs are fastened to six of the joints of the abdomen, and are used as paddles for swimming. They are called swimmerets.

The last joint of the abdomen, or the tail-fin, works back and forth, and helps the animal to swim backwards, when it so desires. The two great claws are not precisely alike. The more clumsy one has coarse teeth, and is used to anchor the animal or hold it firmly to some object, while the other has fine teeth and is used

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for seizing and crushing the prey. Protected by its hard shell, and armed with these huge pinchers, the lobster ought to fight pretty well. And so it does. Indeed, it is so quarrelsome and ferocious that the fisherman is obliged to fasten the claws with pieces of wood, even while the animal is waiting to be boiled.

The crustaceans have a definite head, which is well provided with eyes, ears, mouth and other organs. From the sides of the head reach out two long whip-like things, which are feelers, with which the animals lash the water and touch the objects they meet. On the top of the head is a pair of smaller feelers, at the base of which are the ears.

We hunted about the mantle of the oyster for eyes. See what eyes the crustaceans have, standing out on knobs or stocks. Unfortunately they are very obscure in the picture. Besides being so prominent, they are not common single eyes, but each stock has many single eyes packed together. Well fitted, then, the lobster and crawfish seem to be for moving on the muddy bottom, for catching and eating the dead fish and other animal matter upon which they live, and for fighting away their enemies.

Of course the crustaceans are water-breathing animals, and have gills in which the blood and the air of the water meet. These gills are found at the places where the legs join the body. The young are hatched from eggs. To make room for their growth, the shell or crust is shed, or molted, as many as six times during the first year, a larger crust coming with each change.

In the spring the crustaceans lay their eggs, which

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adhere to their swimmerets. A single lobster lays about twenty thousand eggs. After the young are hatched, they cling to the swimming legs of their mothers until they are about a third of an inch long, when, with bright blue eyes and a pair of small feet for swimming, they dodge about in the water at a lively rate. At this period of their existence they are dainty food for large fishes. At three months of age they acquire all the parts of the grown animal, and then settle down on the bottom like the old people, to catch and to be caught.

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14. CRABS.

TAKE away the rear part or abdomen of the lobster and you have the crab. There are some different arrangements about the mouth, and the crab swims in the water instead of gliding near the bottom, as its near relation, the lobster, does. The soft-shell crabs of the sea are considered delicate eating, but every one does not know how to account for the name they bear.

The soft-shell crab has a hard crust for a covering, as its near friends have. But from time to time it sheds its shell. When the old shell has been thrown off, it is some days before the new shell becomes hard. During this period the crab is very tender, and is delicious food; and on this account it receives its name—soft-shell. It is, however, a common crab.

The whole family of lobsters and crabs is composed

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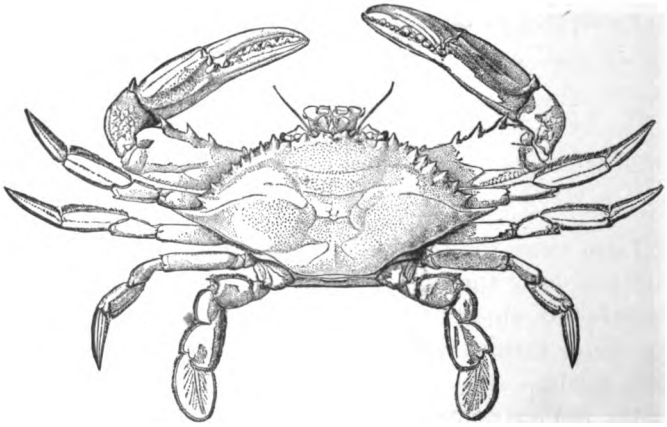
of ludicrous members, but the drollest of all is the hermit crab. It is really more of a lobster than a crab, for it has quite a long abdomen, while the crab has scarcely any. This hermit wears a good shell on the main part of his body; but unfortunately the hinder part is naked and tender, and is exposed to attack.

Now he will surely die if he can not inclose his delicate part in the shell of some mollusk. To find such



Common Edible Crab.

a covering it is necessary for him to be a thief and a robber. Having found a convenient shell of sufficient size, and having dragged the innocent occupant out, the hermit pokes in his tail-part and hooks it fast to the inside of the shell by two small feet, which grow out from the end of the tail, seemingly for this very purpose.

When the lobster grows too big for his shell he

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sheds it, and gets a new one. But the hermit crab occupies the dead shell of another; what shall he do when he outgrows his shelter? As he is often kept in an aquarium his pranks have been carefully watched.

Hermit Crab.

He hunts about until he finds some mollusk like a snail, inclosed in its house. He turns the shell over and over, as if calculating on its size. He pokes a foot within to see who is there. If he concludes that the house is good enough and large enough for him, he jerks out its tenant and himself jumps in—all in a moment.

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15. LEEUWENHOEK.

THE old town of Delfth in Holland is associated with a familiar event in American history. It was from the harbor of this town—from Delfth Haven—that the Pilgrim Fathers, in 1620, embarked on the Speedwell and the Mayflower to sail to America. Another event adds a new interest to Delfth.

It was here that, in 1632, a boy was born who became one of the great discoverers that used the microscope. His name was Anthony van Leeuwenhoek (pronounced Luh'wen hook). As his surname does not slip easily from an American tongue, he may be

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called simply Anthony. The education of Anthony was very imperfect. He never graduated from college, but he seems to have made the most of his limited opportunities.

Only a few years before the Mayflower landed its shivering passengers on Plymouth Rock, and the Half Moon anchored at the mouth of the Hudson, the telescope and the microscope were invented. The principal part of both these instruments is the glass lens. To prepare lenses, and get their shape exactly right, was at that time a great labor. The lenses must be slowly ground and polished. This art was sometimes learned by bright boys, of whom Anthony was one. And he became a lens-grinder.

Those who use the microscope at the present day, find in it a most delightful and fascinating employment. With it they examine things other people have seen and told about, and find, in going over these discoveries, great amusement. How much more enjoyment, then, must those have had who, with the microscope, for the first time, discovered these things.

The opening of the great world of little things created great excitement. Everybody who could buy one, purchased a microscope. The grinding of lenses was a lively business. To this work Anthony devoted both his energies and his wits. Soon he found out how to make much better lenses than any other could construct, insomuch that he was regarded as one of the inventors of the microscope.

Anthony did more than work at his lenses. He himself used the improved lens, in searching out the new and wonderful things in nature. And what did

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he find that was new? "The House I Live In" gives an account of the voyage which a drop of blood makes when it leaves the heart, passes through the arteries to the muscles and bones, and returns to the heart through the veins.

The credit of discovering this trip of the drop of blood is due to an English physician, William Harvey, who died when Anthony was twenty-five years old.

But there was one part of the journey of the blood which Dr. Harvey did not explain. When the red traveler reaches its destination, how does it leave the artery, get through the muscles, and jump into the veins?

Improved Microscope.

This question Anthony answered by the use of his microscope. He found the minute capillary (or hair) tubes which convey the blood from the arteries to every part of the muscles and bones, and throw it into the veins, so that it may go back to the heart and lungs. About the time of this discovery, Anthony received a visit from Peter the Great of Russia, who was delighted to see, through the microscope, the circulation of the blood in the tail of an eel.

He discovered that the human hair is solid and not a tube; that cochineal, which produces red and purple dyes, is an insect and not a seed as people supposed; that the grubs, or maggots, which appear upon spoiled meat are hatched from eggs, and are not sponta-

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neously born from decaying substance. He proved that every living thing comes from a living parent of the same kind. He found the compound eyes of some insects; the beautiful scales on the wings of butterflies: the spinners and poison claws of the spider.

In the gutters of the house roof, there is nearly always collected more or less moss or dirt mixed with leaves. Of course, during the absence of rain, this litter becomes very dry. Now if a pinch of this dust be moistened in water, and placed under a microscope, pretty soon little animals, no larger than the head of a pin, appear swimming and dancing about, as antic as pollywogs. They are called rotifers or wheel-bearers, because they have, at the place where the mouth should be expected, a wheel fringed with lively hairs with which they draw in their invisible prey. Entirely dry, like grains of sand, they may exist for a long time, and wake into activity when wet.

These wheel-bearers were first brought to light by Anthony van Leeuwenhoek. Many other things, also, did he discover with his microscope, and many things about such things as had already been discovered.

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16. SPIDERS.

One is struck with a certain resemblance between crab and spider. The latter has eight walking legs, of which the first pair from the head are used for feelers. They are jointed like the legs of crab and lobster, and

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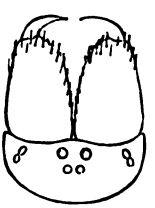
it is said that the leg of the spider will grow out again, should one or two joints be lost. The spider is commonly regarded as an insect. But it is without some very important characteristics which belong to insects, as will be seen in the chapter on the fly.

The spider's jaws are a little like the lobster's pinchers. They are furnished with rough teeth for crunching flies and other food, and are armed at the end, each with a sharp claw which opens and shuts upon the jaw, like the blade of a jack-knife. These jaws are excellent tools for the butcher's work of the spider, and are deadly weapons in the fight. Through the claw runs a tube carrying poisonous liquid which flows into the wound, when a bite is inflicted. The poison, however, affects the human being scarcely more than the poison of the mosquito.



Spider's Jaws.

Eight eyes on the back of the head furnish the animal with abundant power of sight. As to ears, search for them and you will not find them. The creature hears—there is no doubt about that. She loves a tinkling sound, enjoys the strains of music, sometimes letting herself down from the ceiling to hear it. Out of her snug den she will run at the buzzing of a fly, or wasp or tuning fork. Perhaps the hairs on their legs have the faculty of hearing; for when listening to sounds, these hairs are raised, just as some animals erect their ears.

The spider breathes by tubes running through different parts of its body, and by small air sacs—from two to four—which may be called lungs. The method

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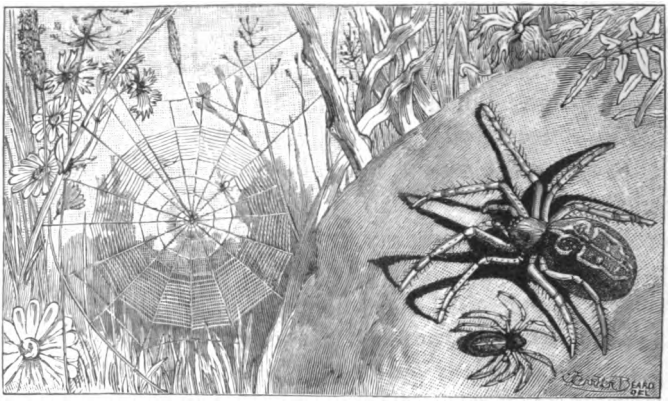
of catching its game is that which makes this animal so interesting. Some kinds of spiders seize their victim by jumping upon it; others by running it down, as the tarantula of Italy does. But most of the varieties make snares for their prey, by their wonderful and exquisite webs. Before explaining their art of spinning and weaving, read a short fairy story of the ancient Greeks.



Garden Spider.

Athena (A the'na) who is sometimes called Minerva, was the daughter of Jupiter, and was the goddess of agriculture. The ancients thought she invented the plow and the rake; and taught how to yoke oxen and to take care of horses. She has the credit of many other inventions. It was she, they said, who invented every kind of work that women performed. She taught the fingers how to spin, to sew, and to weave; and how to work the beautiful embroidery and tapestry in which the Grecian women excelled.

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Arachne (A rack'ne) was a maiden who lived in Lydia. Her father Idmon was a famous dyer in purple, and she was a skilled weaver. She grew bold enough to challenge Athena to a contest in her art; and for her part produced an exquisite piece of tapestry. Athena, because she could find no fault in her competitor's work, grew proud and jealous, and tore the cloth in pieces. Whereupon Arachne, overwhelmed with despair, hanged herself. But the goddess softened a little and loosened the rope, saving the life of Arachne. The rope was then instantly changed into a cobweb, and Arachne was transformed into a spider, the animal which above all others Athena hated.

This story, or fable, is the method the ancients employed of teaching that man learned the art of weaving from the spider, and that the art was invented in Lydia. It is a pleasant way of telling something which is probably quite true. In a great many of the arts men have taken their first lessons from animals.

PART 2.

PASSING by the house spider and the cellar spider, whose webs are woven in a great variety of shapes, the garden, or geometric, spider gives the most interesting example of spinning and weaving. You may have seen her trudging along the ground, lugging a white silken sack which she is reluctant to part with. Perhaps you were not aware that this bundle contained her eggs. Had you watched closely you might have seen the young, after the eggs were hatched, riding on the back of their mother.

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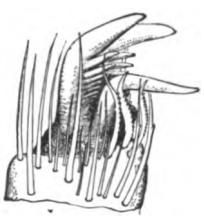
In spinning, the hind foot holds and guides the thread. The foot of Epeira, as the garden spider is called, should be examined and understood. Each foot has three claws, the middle one of which is bent over for clinging to the web. The other two have teeth like a comb, and indeed are used, in part, for cleansing the limbs and webs. Over against the claws are stiff hairs which are also toothed, and which shut like a thumb against the claws.



Spider's Foot.

The wonder of the spider is the manufacture of her silk web. On the back of Epeira are six points, each about the size of a pin's point. These are her spinnerets. Each spinneret contains a multitude of fine tubes—some say a thousand—from each of which issues a sticky fluid made in the body of the spider. This fluid hardens as soon as it feels the air; and the minute threads join to make a strong cable. The six spinnerets may each make a separate cable, or by bending toward one another may join all into one. The spider's thread is not more than a four-thousandth part of an inch thick.

Spinnerets.

Epeira chooses a place for her gossamer wheel where the ends may be securely fastened, and where she may make for herself a convenient den. After throwing across the space a thread or two, she carries out from the center several rays or spokes, making each tight. She fastens a web to an object by simply touching the spinneret to the object. Having ar-

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ranged the spokes, she begins at the center and runs a spiral thread round and round.

These spiral threads are smooth and dry, and are as far apart as the spider can conveniently reach. They are intended only for a temporary scaffolding to walk upon. Now Epeira begins at the outside or circumference of the wheel and works toward the center, carrying round and round a new thread which is wet and sticky, all the while biting away the scaffold before her. Thus she leaves the sticky thread behind her, while she has the smooth, dry one to walk on.

After all is finished, Madam Epeira builds a silken den for herself to hide in, in some place near by, where she may be secure and at the same time watch her work. A single telephone thread joins the woven net to her den, and upon this line she holds her sensitive foot. Should a fly strike any part of the net, she instantly feels the touch, hastens to the spot, and makes the intruder a prisoner, by spinning about its legs and wings a strong rope of silk. Though beautiful, it is a certain death-trap for the fly; and though so elaborate and perfect, it may be constructed in three quarters of an hour.

All the wonderful work done by the spider is performed by the female. The male of some kinds is exceedingly small in comparison; so much so, that as a certain naturalist calculates, were he a man six feet high and weighing a hundred and fifty pounds, she, supposing her to be a woman, would measure seventy-five feet high and weigh two hundred thousand pounds. Her treatment of her poor, insignificant mate is set forth in the following little poem.

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17. MISS SPIDER'S WEDDING BREAKFAST.

A FAT little spider married would be,
So he made him a rope and climbed a tree
To where Miss Spider was making a pie
Of a bumble bee and a small house fly.

And she wed him there in the morning light,
When the dew on the grass was round and bright,
Then spread out her table so lacy and fine,
And off from her husband began to dine.

She ate him all, from his head to his heel,
And never a pang of remorse did feel,
But, as curled up close in her cosy bed,
"That spider was tough," to herself she said.

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18. AMONG THE INSECTS.

ON the copy from which this page is printed a fly lighted. Did he think I was writing about him? And had he come to see that I did not slander him? He stands still, and does not mind a motion of the hand, as flies usually do. He has found something to eat—that explains it all. Thank you, Musca, for I believe that is the name they have given you. I want to look you over a little.

A spot of mucilage on the paper seems to attract him. Keep still! There is a magnifying glass at hand

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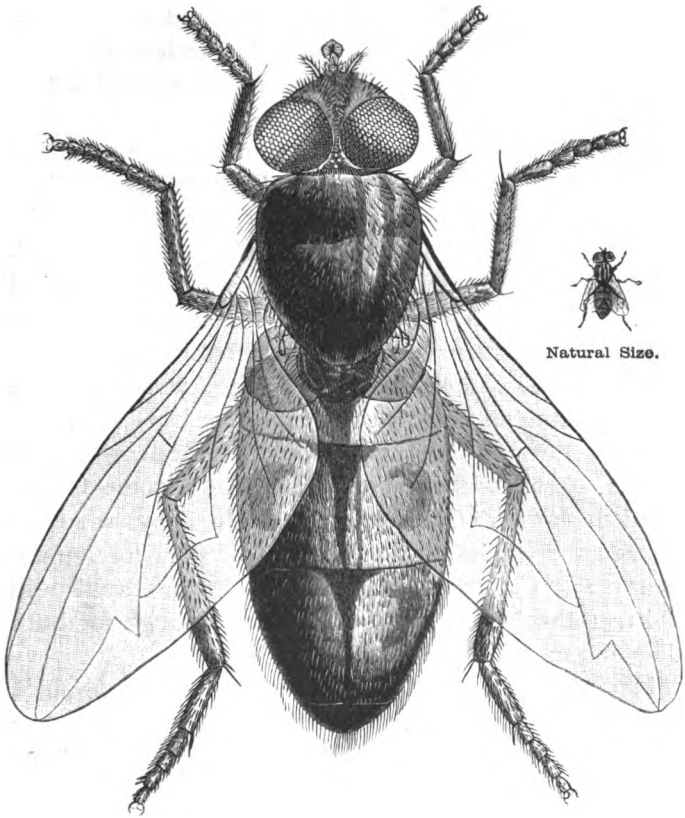

Fly Magnified.

which I will hold over him. He lets down his bill, or trunk. Even with the naked eye, I have often seen flies do that; but I see more accurately with the glass. The mucilage is hard, but he will penetrate it, for he is dropping moisture upon it from his tongue.

Soon I have looked him nearly all over; have seen

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his bill unfold, and the knob on the end of it divide and spread out flat; have seen his feelers reaching forward from his head, his two round eyes, his two wings, and six legs.

Now Musca is through with the mucilage, and begins a droll performance. The fore legs are rubbed together, in the most lively manner, to clean away the gum and dust that stick to them, I suppose. He balances himself on the middle pair, and rubs the hind legs in the same way. Again he comes to the fore legs, and I discover something that reminds me of the cat. He touches his legs to his lips, which are one with his tongue, and with them washes his face.

I am through with you now; you can go, little Musca. I shall not injure you. There come to my mind the words of kind-hearted Uncle Toby, when he opened the window to let out one of your foreign ancestors: "Get thee gone," he said; "for why should I harm thee? Is not the world big enough for both thee and me?"

Having gathered all the facts my eyes can reach, I will now turn to books to ascertain whether some other one has seen more than I have, and whether I have seen correctly. Webster's Unabridged Dictionary, which contains much information besides definitions, says the fly is a "winged insect." The winged feature is very clear, for on Musca's back I saw two gauzy wings with bronze and purple tints. Turn now to "insect." This is a name given to certain small animals whose bodies appear cut in, or almost "divided"—so the great book says.

This knowledge is helpful. The fly did appear "cut

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in"—not in two, but in three—parts. The book has named the parts. They are the head, the thorax, and the abdomen. These, jointed together, were seen in Musca; and I further observed that the six legs and the two wings were attached to the thorax, or middle division. With the aid of the glass I could see the short feelers, or antennæ, on Musca's head. Keener eyes may see them without the glass.

Much more can not be seen, except by dissecting the fly and examining its parts under a microscope. The fly has no hard jaws or teeth, as some insects have, and can not bite. When the tongue is unfolded to touch a piece of sugar, the knob on the end of it spreads out into two flat leaves covered with small hair-tubes. The sugar is first moistened and dissolved; then scraped and sucked up by the hairy lips. In like manner book-covers and pictures are injured, the fly scraping them with the leaves of its tongue.

The eyes of the fly seem to be two, but the microscope discovers that they are composed of a great many—several thousand—minute eyes, each with a little nerve of its own. Three small and single eyes are on the back of the head, but their precise use is not known.

PART 2.

WHEN the fly walks, three legs are thrown forward at one time—two on one side and one on the other. The microscope reports that the leg and the foot are covered with stiff hairs, so that they are like combs or brushes. This is the reason, then, why Musca rubbed his legs together—that one brush might clean the

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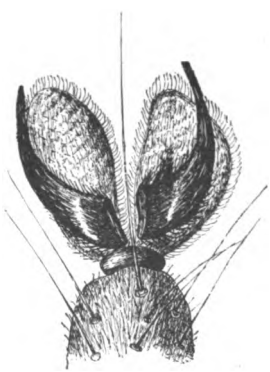
other. The foot is quite as wonderful as the eye, for its construction shows how the fly can walk with its back downwards, and on smooth surfaces.

On the last joints of the foot are a pair of claws under each of which is a pad or soft cushion. For a long time it was supposed that the pads were hollow like cups, and adhered to the surface by pressing out the air. This has been found to be a mistake. The latest discoveries, as given by Prof. C. V. Riley, prove that the pads are beset by ever so many knobbed hairs, as shown in the drawing.



Fly's Foot Magnified.

From each hair flows a fluid which keeps its end or disk moist, and enables it to stick. The smoother the surface the more closely will the hairs stick. On rougher surfaces, like a whitewashed or papered wall, the delicate claws are able to cling to the microscopic unevenness, without aid from the hairs.

Where are the fly's ears? The sense of touch is chiefly in the antennæ which project like horns from the forehead. Some other insects, as the cricket, have very long antennæ. The fine hairs on the legs, also, have the power of feeling. But there are no ears to be found.

It is equally difficult to find the fly's nose. But it is evident that it can smell. Careful and continued observation has proved that the fly and most other insects feel, hear, and smell with their antennæ. A sort of

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ear, it should be said, has been found on the abdomen of the cockroach.

Having learned how easy it is to crush a fly or a mosquito, it is well to inquire about the bones of these animals. A bird or a chicken can not be so completely pulverized by pressing upon it. After the flesh, or soft part of the chicken is removed, the bones—hard and tough—remain. After the horny case that incloses the insect is broken, the soft parts, or flesh, are found within. The crust that envelops it, is the fly's skeleton. The fly wears its skeleton on the outside of its flesh; the chicken wears its skeleton on the inside.

The fly digests its food much more simply than does the chicken. Through its body runs a single tube which is enlarged in one place for a gizzard armed with horny teeth; and in another place it swells into a sac for a stomach. No red blood appears to flow when the insect is wounded or crushed. The blood of insects is white or colorless.

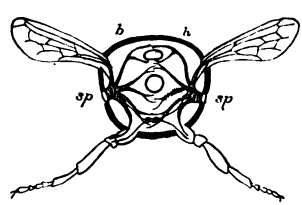

Fig. 9. Breathing Tubes of Fly.

Another peculiarity of the fly, and of its fellow insects, is the way in which they breathe. They do not draw the air through the mouth into lungs, as we do. They have no lungs. In the crust which covers their bodies are holes, or spiracles (*sp*), that open into tubes. These tubes, swelling into air-sacs here and there, branch into every part of the body. Alongside of them lie the blood-vessels which receive air from the tubes, as our blood takes air from our lungs.

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After finding so many odd features in the fly, it need not be surprising to learn that the young fly comes to be full-grown in a wonderful way. The hen lays an egg from which a chicken is hatched—a small, downy, feeble thing—which in two years becomes an adult fowl. The fly lays an egg that hatches, when behold! not a little fly, but a small, white worm or grub about one third of an inch long. This thing the ancients called a larva, which means a mask, because a real fly was supposed to be hidden within.

The fly's eggs are laid and hatched in the litter which collects about the stable, or elsewhere. The minute grub eats heartily for perhaps a week, and then appears to die, and change into a shelly case. To this little thing, quiet and motionless as a mummy, the name pupa was given, which means a doll or girl. In about two weeks this pupa splits open, when, not a doll or a girl, but a full-grown, full-winged fly steps out, dries its wings, and flies away, as if it knew all about the world.

After the great army of summer flies has been destroyed by age, by fly-traps, and cool weather, a few strong ones remain stupid, sleeping like woodchucks and bears, until spring. Then, about the month of May, the laying commences, a single fly depositing several hundred eggs. These hatch, pass through the changes described, and many of them, in turn, produce eggs. The easiest way to be rid of the immense swarms of summer is to destroy the spring mothers, which are few. In the same way it is easier to strangle a bad habit than to fight down all the wrong actions that spring from it.

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19. A MUSICAL BURGLAR.

ISAAC T. HOPPER was a kind, humorous Quaker, who lived in New York City forty years ago. He was always ready to give or take a joke. One day when he was buying some peaches at a fruit-stand, he said to the woman, "A serious accident happened at our house last night. I killed two robbers." "Dear me!" she exclaimed. "Were they young men, or old convicts?" "I don't know about that," he replied. "I should think they might have been by the noise they made. But I despatched them before they had stolen much. The walls are quite bloody."

"Has a coroner's inquest been called?" inquired the woman. When he answered "No," she lifted her hands in astonishment, and exclaimed: "Well now, I do declare! If anybody else had done it there would have been a great fuss about it; but you are a privileged man, Mr. Hopper." When he was about to walk away, he said to the woman, "I did not mention to thee that the robbers I killed were two mosquitoes."

The insect to which the Spaniards have given the pretty name of mosquito is a burglar. It enters the house at night for the purpose of stealing. For a robber its way is a bold and honest one. It is not a sneak-thief. With the sound of music it advances, for it is a bugler as well as a burglar.

Why does this winged robber so loudly announce her coming? Rather, one would say, let her slip quietly in when the victims are asleep, take a little tube full of blood and be off.

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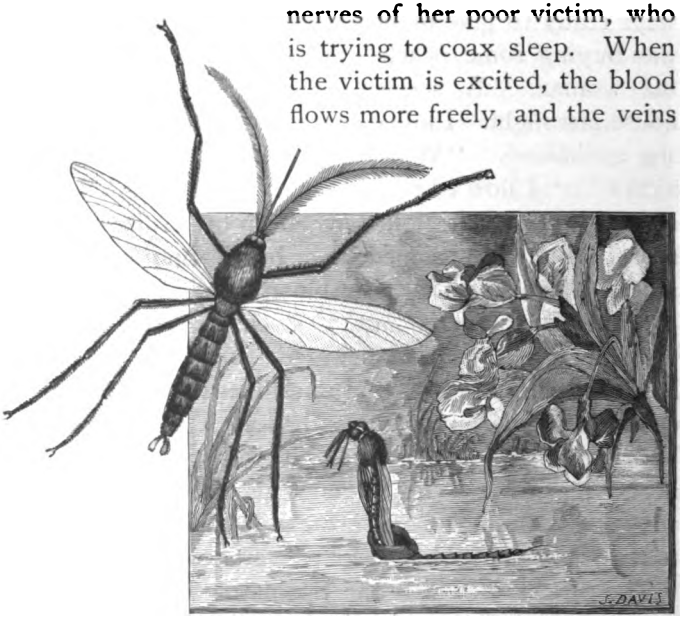
To most people the bugle of the mosquito is as unwelcome as her lancet-sting. It gives a musical sound, but there are fidgety thoughts of surgery and blood mingled with the music. Possibly this is the very reason why the mosquito pipes her tune—to irritate the nerves of her poor victim, who is trying to coax sleep. When the victim is excited, the blood flows more freely, and the veins



Mosquito and Imago Magnified.

are full. Very appropriate is it, therefore, for this visitor to fill a vein by her noise, before she taps it with her beak.

Like the house fly, our night-warbler has the characteristics of the true insect—the head, the thorax, and the abdomen; the six legs and two wings. In some respects she is different from the fly, and she is

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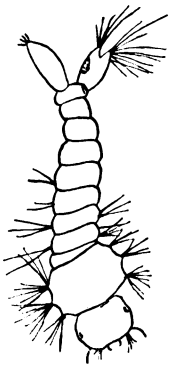
far more beautiful. Her form is more graceful and elegant. Her attire is as gorgeous as a queen's. Her wings, as thin as a spider's web, are of soft, amber color. Her breast is brilliant red; her body dark green; her eyes glittering like diamonds; the proboscis, with which she pierces for blood, keener than the finest needle-point, and bright, like polished ebony. All this beauty, however, is lost in the darkness of night, and in the day-time, can be seen only by the aid of the microscope.

The complete mosquito lives wholly in the air, though its infancy is passed in the water. The egg from which it is hatched is one of several hundred which, when laid, are glued together in the shape of a boat, and set afloat on the water. In about a week these eggs are hatched, and then appears the swarm of larvæ, or "wigglers," so often seen in a stagnant pool, where they eat the particles of decaying matter that may contain the germs of disease. When the water is undisturbed, these active swimmers are found near the surface, with their heads downwards. They breathe the air through a hairy tube extending out near the tail. Touch the top of the water and they quickly wiggle to the bottom for safety.



Mosquito Larva.

From ten to fifteen days after these larvæ—the wigglers—appear, they change into the pupa state. The pupa sheds its skin several times, and moves or tumbles around by the use of two small fins or paddles. In about ten days, when the perfect mosquito is grown

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within, the pupa shell bursts open on the back and forms a boat or raft. The mosquito puts out its head, then one pair of legs after another, until all are out, and the wings are free though wet. Now it balances itself on its tail, waiting for the legs and wings to grow strong and dry enough for use. This is a dangerous moment. A gust of wind or a drop of rain will cause a shipwreck. For this reason mosquitoes are only brought forth in still or stagnant waters.

PART 2.

WHEN the voyage of infancy is successfully passed, the complete mosquitoes begin life on the wing. The males, during a very short life, remain in the woods and marshes. The females alone do the biting, and they at once set out to find victims that have blood. Whether they can see in the dark, or can scent their prey afar off, it is not certain. Something enables them to find human habitations, and the sleeping inmates whom they serenade.

The beak that extends out in front of the head is a case of piercing instruments which our burglar brings with her. They are the mouth-parts of the mosquito, and are very different from the mouth-organs of the house fly. When not in use, they are laid close together, and are sheathed by the under lip.

In Figure 10 appears the head of the mosquito with its compound eyes. Curving out from the forehead, to right and left, are the antennæ, or principal feelers (*a*). Below these is the upper lip (*ul*) which has a groove running its full length to receive the

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tongue (*t*), the two large jaws (*lj*) and the two small jaws (*sj*). These jaws are not really such, but are more like fangs. The upper ones, indeed, convey poison into the wound, as do the fangs of the rattlesnake; and this poison dilutes the blood and makes it flow to the tongue through which it is drawn into the stomach. The lower jaws are barbed at the end, that they may work back and forth like saws.

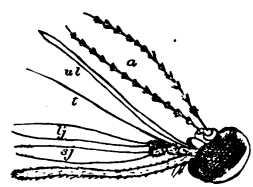

Fig. 10. Mouth Parts.

These mouth parts are spread out in the figure, to show them more distinctly. When the mosquito bites they are pressed together in the upper lip, making a beak like an awl. When our tuneful robber proposes to take blood, she discourses her music in circling flights about an uneasy head, until she finds a favorable spot. There she lights, gracefully setting down one foot after another, and at once thrusts through the skin her compound awl,—sheath, poison fangs, saws and tongue—and draws her meal of blood.

Some have supposed her song to be caused by the motion of her wings, which make fifty vibrations in a second. Others have thought the song to be produced by the insect blowing through her breathing tubes. Whatever its cause, the mosquito's tune would be a charming one were it not associated with instruments of torture and a blood-thirsty tongue.

There are in this country over thirty varieties of mosquitoes. Some are small and others are quite large. Some live wholly on vegetable juices, while others have a passion for animal fluids. The largest, and perhaps

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the most ferocious kind, is one which the steamboatmen of the Mississippi River call the gallinipper. Of it they tell strange stories. They describe it as being as large as a goose; and they gravely declare that it flies about at night with a brick-bat under its wings to sharpen its beak with.

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20. TO A MOSQUITO.

FAIR insect! that with thread-like legs spread out,
And blood-extracting bill and filmy wing,
Dost murmur, as thou slowly sail'st about,
In pitiless ears full many a plaintive thing,
And tell how little our large veins would bleed,
Would we but yield them to thy bitter need.

Unwillingly, I own, and, what is worse,
Full angrily men hearken to thy plaint;
Thou gettest many a brush, and many a curse,
For saying thou art gaunt, and starved, and faint;
Even the old beggar, while he asks for food,
Would kill thee, hapless stranger, if he could.

Beneath the rushes was thy cradle swung,
And when at length thy gauzy wings grew strong,
Abroad to gentle airs their folds were flung,
Rose in the sky and bore thee soft along;
The south wind breathed to waft thee on the way,
And danced and shone beneath the billowy bay.

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21. THE HOUSE CRICKET.

TENDER insects, says White, that live abroad, either enjoy only the short period of one summer, or doze away the cold, uncomfortable months in profound slumbers. But the house crickets, residing, as it were, in a torrid zone, are always alert and merry. A good Christmas fire is to them what the heat of the dog-day is to others.

Around in sympathetic mirth,
Its tricks the kitten tries;
The cricket chirrups in the hearth,
The crackling faggot flies.

As one would suppose, by their living near fires, they are a thirsty race, and show a liking for liquids, being frequently found drowned in pans of water, milk, broth, or the like. Whatever is moist they seek for, and therefore they gnaw holes in wet woolen stockings and aprons that are hung near the fire. These animals are not only very thirsty, but very hungry; for they will eat yeast, crumbs, and kitchen sweepings of almost every description.

In summer they have been seen to fly, when it became dusk, out of the windows and over the neighboring roofs. This accounts for their coming to new houses where they were not known before—pleased with the moisture of the walls, and getting into the soft cracks between the bricks.

Common prejudice frequently prevents any attempt being made to rid the house of this noisy animal. Many persons imagine that their presence is attended

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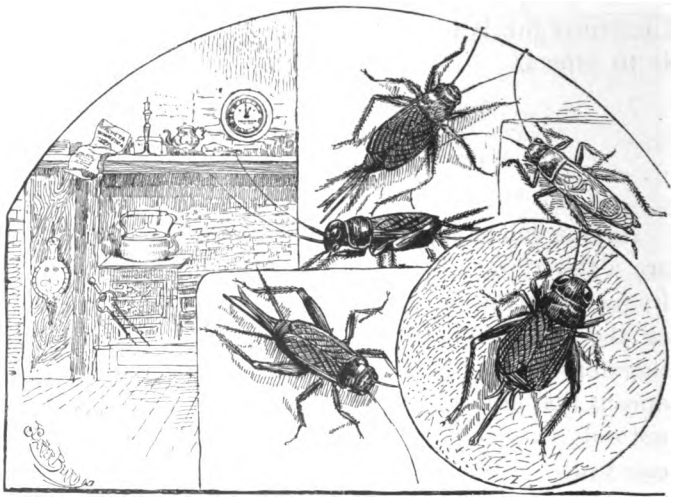
with good fortune, and that to drive them away or kill them will bring some misfortune on the family.

The noise of the cricket is produced by the male. He elevates his horny wing-cases, and rubs them briskly together. The sound, no doubt, suggested the name, for it is just like the syllables, *cree-cree*. It is in the dusk of the evening, when friendly faces are assem-



House and Field Crickets.

bled around the blazing hearth, that the warmth raises the cricket's cry. It is the single tale, the one chant of its life; and however loud the conversation or the laugh, its shrill note is heard through all.

This shrilling of the cricket was once so troublesome to a lady as to cause her to resort to every means to dislodge the insect from its roost; but all in vain. It so happened that a wedding was celebrated in her

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house, with all kinds of music. The trumpet and the drum were rather more than the cricket could cry down; and whether from fright, or from anger at being conquered, it is not certain; but certain it is that crickets never again troubled the house or the lady. There are few, however, who object to the cry; for over the hearts of most men the merry chirp of the house cricket has power, calling up those days when its single note was mingled with many a voice which will not, perhaps, be heard again.

The learned Scaliger, who lived in Italy more than three hundred years ago, kept some crickets in a box to cheer him in his labors. This practice also prevails in Spain; and in Africa persons make a trade of crickets. They feed them in a kind of iron oven, and sell them to the natives, among whom the noise they make is thought to be pleasing; and these people believe that it assists in lulling them to sleep.

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22. CRICKETS OF THE FIELD.

WHILE taking our evening rambles over the field, we sometimes hear the cheerful summer cry of the field cricket. But they are so sly and cautious, says White, that it is difficult to obtain sight of one of these sonorous animals; for, feeling a person's footsteps as he advances, they stop short in the midst of their song, and retire backward, nimbly into their burrows, until all suspicion of danger is over.

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There is one way, however, by which any one may obtain his wish,—by gently pushing a limber stalk into their burrows, which will probe their windings to the bottom. This will quickly bring out the animal as it lays hold of the stalk with its paws.

When the males meet, they fight fiercely, as White found by some which he put into the crevices of a dry stone wall, where he wanted them to settle. The first that got possession of the crevices would attack any that tried to enter. They would seize them with their strong jaws, which are toothed like the shears of a lobster-claw. With these jaws, too, they bore and round their curious cells.

They feed on such herbs as grow before the mouths of their burrows, and rarely stir more than two or three inches from home. Sitting in the entrance of their caverns, they chirp all night as well as all day, from the month of May to the middle of July. In hot weather, when they are most vigorous, they make the hill echo; and in the still hours of darkness, they may be heard at considerable distance.

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23. BUSY BEES.

It requires a busy pen to write about busy bees. There is the bumble bee sporting in a yellow and black jacket, and sometimes called Bombus. What brave boy in the country has not at some time made a hero of himself by attacking a bumble bees' nest?

We learn that Bombus, if undisturbed in her hum-

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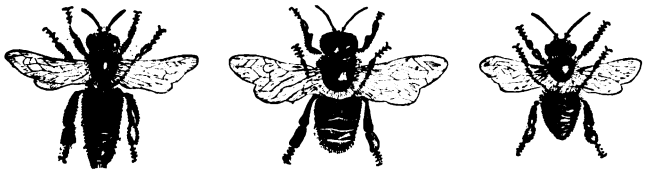
ble home, does some valuable work, though she has no honey to spare. Because she has a longer tongue than the honey bee has, she can reach the nectar in the deep corolla of a red clover flower; and in so doing she carries the pollen from one stem to another, thus enabling the flower to bear seed. No bumble bees, no clover seed. The people in New Zealand tried to raise clover and failed. Why? The bumble bee was not there. So they imported her, and, doubtless, were happy in their sweet-scented crops of red clover. Truly great is Bombus! But we must let her go.



Queen. Drone. Worker.

The hive bee is our busy, curious, wonderful honey-maker. The honey bee is a trinity—the queen, the drone, and the worker. All the three are necessary to the life and prosperity of the colony, which may contain fifty thousand busy people. The picture shows the form peculiar to each of the three. The queen is the mother of the whole colony. The worker-bees respect and love her because she is mother. She does not rule the workers, nor does she direct their movements. The bee-government is purely a government by the people. The workers can get rid of the queen or make a new queen when they choose.

The workers are females, but as a rule lay no eggs.

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The drones are males, but neither work nor sting; for the best of reasons—because they have no tools for working or stinging. The queen and the workers have a sting in the abdomen. The workers defend the hive by the use of this weapon, but they never attack when abroad and about their work. The queen uses her sting in combat with another queen, but never upon a human hand; so that she may be handled without danger.

Improved Hive.

All bees have compound eyes. Ears, or hearing organs, they must have, for the piping of the young queen in her cell sets the others astir. They smell, also, for they follow the scent of unseen honey. Where the ears and nose are, it is not certain. They may be in the antennæ, where is also the sense of feeling.

The business of bees is gathering food for themselves and for their young. If they are well kept, they store a great deal more honey than is necessary for this purpose. From this abundance comes the honey which human people use. To understand the work of bees you must gather some flowers and have them explained to you. The material which bees procure for their use

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is the sweet or nectar of flowers, and the pollen or flower-dust. This pollen lies on the stamens of flowers, and must be conveyed to the pistils in order that the flower may ripen into seed or fruit. This explains something about the clover already referred to. There is also a sticky substance called propolis, with which the bees fasten their comb to the hive or frames, and which they gather from willow or alder trees.

The worker-bee's mouth is perfectly adapted to the work of taking nectar from flowers. It has a long lip and a much longer tongue. Jaws there are, too; not harsh ones like the beetle's, but strong enough to serve the bees in working wax and bee-bread. Suppose a queen and a few workers have weathered the winter and are to commence their spring work. The first thing they need, beside their daily food, is wax. The workers start out for flowers and nectar. The queen never works.

The sweet-scented flowers rarely yield nectar; so the workers find the red and golden maple, and among later blossoms the flowers of apple, quince, raspberry, white clover, and buckwheat. These they probe with their tongues—sometimes crawling into them—and lick up the nectar. This sweet goes to their stomachs, where it is made into two things—honey and wax. The material for about twenty pounds of honey will yield one pound of wax.

Bees have a fine sense of direction; and when about to return from their pastures, which they sometimes follow as far as four miles from their hive, they rise in the air and whirl round so as to see the familiar objects about them, and then start off in a perfectly

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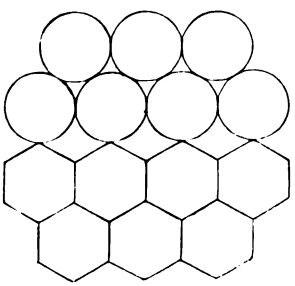
straight line, which is called a "bee-line." Having filled themselves with nectar, and having taken a good drink of water, they fly back to the hive, and hang from its top in thick clusters or festoons, holding to one another by their legs. In twenty-four hours, small plates of wax appear in pouches on their under-parts, or abdomens.

The workers shake the wax from their bodies, or pick it out of the pouches with their feet; then take it in their jaws, work it over with saliva, and from it build cells in double rows. A great many are at work, and they crowd one another closely. Wonderful indeed are these cells! always six-sided; never round or square. Why are they six-sided, and not square? How awkward for a round animal to turn in a square hole! But why not round? With the diagram before you, these questions will be left for you to study upon.



Hexagons and Circles.

Besides nectar for honey, pollen is required for bee-bread. This is mixed with honey for ordinary food, and is quite necessary in the preparation of baby-food for the young or larvæ. Should you ask a bee why, in gathering pollen, she confines herself to one variety of flowers at one time, she could, perhaps, give you no reason, even if she could talk. To keep the different kinds of plants unmixed, it is necessary that this should be so.

The pollen is scraped up and rolled into balls, and

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then packed into little baskets at the middle joints of the hind legs. The right foot is used to fill the left pocket, and the left foot to fill the right pocket.

PART 2.

THE cells are made for four different purposes—for the young workers, drones, and queens, and for storing honey. Four drone cells or five worker cells will measure an inch. The queen cell is larger. Honey cells are not uniform in size, but are about a half inch deep by a quarter inch in diameter. Remember the queen lays all the eggs. She places a single egg in each nursery cell, always being careful to deposit worker eggs in worker cells, drone eggs in drone cells. She makes no mistakes. The grown workers seal up these cells, leaving little holes for air to enter, when the young shall be hatched. The honey cells, when filled, they always seal tight to keep the honey from turning to candy. In about three days the eggs in the cells are hatched, and the young appear in the shape of small, white grubs or larvæ.

Now some of the workers act as nurses, and are busy preparing food for the young in their cells. Pollen, honey, and water are mixed, and partly digested in the stomachs of the nurses, and this mixture is fed to the working and drone infants. A more stimulating substance, called royal jelly, is given to the queen-grubs, of which there are usually about five. And, strange as it may seem, should all the queens be destroyed, the workers will feed the royal jelly to a worker-grub not more than three days old; enlarge its

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Hiving the Bees.

cell, and in due time it will become a queen. In five or six days the larvæ have attained their full growth. Then they cease to eat, spin about themselves silken cocoons, become pupæ, and the workers seal their cells. In twenty-one days from the laying of the eggs, the perfect insects—the full-grown bees—come forth.

About this time, which is likely to be in May or June, swarming commences. The new workers and drones are released from their cells, but not so the

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queens. They are still confined, and are strongly guarded by the workers, who bore holes in the cells, through which openings they pass the food. The old queen hears the piping of the royal prisoners, and becomes greatly excited; and from jealousy would destroy them if she could. Then a large portion of the bees fill themselves with honey, and joining the old queen, in a dense, whirling body leave the hive, and cluster, it may be, on some branch from which they are carefully swept into a basket, and are then put into a new hive.

It is when the new swarm bursts forth, that some people in the country raise a cry and a din with tin pans and cow-bells, hoping by this means to make the bees settle. Precisely this same practice was common among the Romans more than two thousand years ago. The old-fashioned hive in this country is a piece of a hollow tree, called a "gum." In Europe it is made of straw, and has the shape of a little dome and is quite picturesque.

The Romans used a hollow cork-tree. Our improved hives have movable frames in which the bees make their comb, as shown on page 94. In the lower part of the hive are the brood combs and some of the honey. In the upper part, in nice frames, in glass boxes, or in other receptacles, the bees store their surplus honey, and in these it is easily removed.

With the improved hives, the wild swarming and the music of the tin pan may be prevented. Some of the frames containing brood-comb may be gently taken out and set into a new hive. The old queen may be found and transferred to the new home; or a queen cell, near

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the time of hatching, may be cut out and inserted in the comb in the new hive.

If handled gently, bees are not apt to sting, though the bee-hat and a little smoke are often made use of. A very pretty case of swarming is told by a French bee-keeper: "A young girl of my acquaintance, who was much afraid of bees, was completely cured of her fear by the following incident: A swarm having come off, I observed the queen alight by herself at a little distance from the apiary (bee-house). I immediately called my little friend, that I might show her the queen. She wished to see her more closely.

"So after having caused her to put on her gloves, I gave the queen into her hand. We were in an instant surrounded by all the bees of the swarm. I encouraged the girl to be steady, bidding her be silent and fear nothing. I then made her stretch out her right hand, which held the queen, and covered her head and shoulders with a very thin handkerchief. The swarm soon fixed on her hand and hung from it as from the branch of a tree. The little girl was delighted beyond measure, and the spectators were charmed with the interesting spectacle. At length I brought a hive, and, shaking the swarm from her hand, it was lodged in safety, and without inflicting a single wound."

The life of the first brood of workers is about six weeks. Those hatched later in the season live longer, and a few endure the winter. The queen may live four years. The drones, which number about one thirtieth part of a hive, are all slaughtered by the workers, during the latter part of the summer. They are of no use now. They neither work nor sting; and why should

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they be fed? Bee-life, like other insect life, like bird-life, and man-life, is beset with struggles and dangers. Bee-moths, rats, mice, woodpeckers, bee-martin birds, toads, and bears are all after the little honey maker's honey or its life.

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24. A NICE LITTLE HOUSEKEEPER.

Jenny. WELL, Mrs. Ant, I am glad to see you here again. I quite missed you.

Ant. I am much obliged to you for thinking of me, Miss Jenny. However, I have not been away since the last time I had the pleasure of meeting you.

Jenny. But I have seen nothing of you since last October, though I have come to the nest several times to inquire for you.

Ant. I assure you, Miss Jenny, I have not stirred from this spot since last autumn, until yesterday, when I came out for the first time, and we began our spring house-cleaning and repairs, which you see are going on very actively.

Jenny. I should like to see the interior of one of your houses.

Ant (in great alarm). I hope you will not think of examining one of them, Miss Jenny. It would afford you very little gratification, and it would inflict great injury on us.

Jenny. Do not be disturbed, Mrs. Ant. I have not the least idea of digging up your nice nest and spoil-

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ing all your walls and galleries. But I should be glad to have you tell me something about them.

Ant. I hardly know how to describe them to you, my dear. We build almost entirely under ground, excavating arched chambers, sometimes round or oval, but all well smoothed and hard finished. These are connected by galleries. Some of our nests are three or four feet deep, and occupy a large space, like this one, which you see, has several different entrances.

Jenny. I should like to hear something more about ants, if you are not too busy to talk to me.

Ant. O, I have nothing to do at present. This is my resting-time, and I am glad to enjoy it, for I was working all night.

Jenny. Do you work all night?

Ant. Sometimes, when it is moonlight, and we are very busy. At this time of year, especially, when storms are frequent, we are very glad to avail ourselves of every hour of dry weather. But as I am at leisure I can answer all your questions. The nest of the horse-ant consists, like ours, of a great many cells and galleries; though about half of their apartments are above ground. They transport their young ones from the upper to the lower stories, when it grows cold, and back again when the sun shines out. There are other ants which build their nest wholly in the earth. These ants work only after sunset, and are very industrious and ingenious. Their walls, pillars, and arches are all made of soft clay, well worked and tempered. Each ant brings in its mouth a morsel of clay and joins it to the rest, smoothing it with her jaws and patting it with her forefeet.

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(*One of the ants just at this point runs up to the speaker, and after patting her on the head with her feelers, hurries away.*)

Jenny. What did your friend do that for?

Ant. She told me in the ant's language, that there was a lump of sugar lying in that flower-pot, and advised me to go and help myself before it was all eaten up.

Jenny and the Ant.

Jenny. Did she say all that with those motions? I did not hear her make any noise.

Ant. We never make a noise when we talk. We talk altogether by signs.

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Jenny. But why do you not go and share in the feast with the others, Mrs. Ant? Do not let me detain you, if you wish to go.

Ant. Thank you; I do not care for it. I am going to milk one of our cows by and by.

Jenny. Why, what do you mean?

Ant. I am going to milk one of our cows, I say. What is there surprising about that? Your father keeps several cows, does he not?

Jenny. Why—yes. But ants! Pray how large are your cows?

Ant. They are very small,—not quite so large as we ourselves. Just turn up the leaves of that rose-bush. There! Do you not see a number of little pale green insects?

Jenny. Yes; I have often seen them before. They are plant-lice, and they do a great deal of harm to the shrubs.

Ant. Well, however that may be, the aphides, or plant-lice, are our little cows, and yield us an abundance of nice milk as sweet as honey. Very frequently they live in the nest with us, feeding sometimes upon the roots of the plants about us, and sometimes upon the provisions we carry in for them. We take good care of them and of their young, keeping their eggs in the warmest part of the nest, in order that they may hatch out early and so supply us in the spring. Now I will milk one of them. You see I pat it gently with my feelers, when it gives out two drops of clear sweet fluid. These cows are our most valuable property, and we should fight furiously, if any one should interfere with them.

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PART 2.

Jenny. So you do fight sometimes.

Ant. Yes, indeed; we have sharp battles, and often leave half our number dead upon the field. These combats sometimes take place between different races, and sometimes between two colonies of the same race. At such times you may see thousands of ants biting, struggling, wrestling, and overturning each other in the dust, till night puts an end to the combat.

Jenny. But what do they fight for?

Ant. Sometimes for one thing, sometimes for another. Perhaps two parties have seized the same spider or earth-worm, or the ants of one hill trespass upon the pastures and seize the cows of another. But there are ants who go out to war for the express purpose of making prisoners, which they carry home to their nest.

Jenny. What do they do with them? Not eat them, I hope.

Ant. O, no—not quite so bad as that. But these prisoner ants do all the work of the nest afterwards. The red ants, who are the fighters, start on these plundering expeditions between two and five of the afternoon of a fine day, first sending out ants to explore about the hill they intend to attack. Upon the return of these scouts, they set out, and having reached the colony, they attack it with great fury. The dark-colored ants, which they attack, defend themselves with great bravery, but in vain. The red assailants are the strongest, and in a few minutes they may be seen coming out, each with a young ant or an egg in her mouth,

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with which she hastens homeward. They take good care of these slaves, who in turn take upon themselves the whole work of the nest. They feed the young, repair the dwelling, and lay up the provisions. They even feed their masters—putting the food into their very mouths. Though these masters are such fighters, they are very lazy, and will starve rather than wait on themselves.

Jenny. What silly creatures! I do not see any of those dark-colored ants in your nest.

Ant. No; we do our own work, and never interfere with our neighbors so long as they do not trouble us. We nurse our little ones, lay up our own provisions, and all bear an equal share in the repairs and other necessary labors about the nest.

Jenny. I should like very much to hear about your little ones. I do not know that I have ever seen them.

Ant. You have seen them, though probably you did not know what they were. In their immature, or pupa state, they look very much like white seeds, or very small fine grains of boiled rice.

Jenny. I have seen your friends carry such things in and out of the nest, but I supposed they were laying something up for food. But why do they bite off the ends? I have seen them do that sometimes.

Ant. That is to assist the young ant in making its way out. You may have noticed that we take great care of these eggs—sometimes laying them in the sun, sometimes carrying them into the interior of the nest.

Jenny. Yes; I have often wondered what it was for.

Ant. In order that they may have just as much heat as is good for them, and no more. A great part

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of the duty of the workers consists in taking care of the eggs and young ones, and in attending on the queen and leading her about.

Jenny. Then you have a queen, do you?

Ant. Yes; but our queen is only the mother of the community, and has no authority whatever over us. She is, however, treated with the greatest respect and affection by us all. Wherever she goes, we press around her, offer her food, brush her dress for her, and help her up steep ascents, and through narrow passages. As often as she goes through the nest, the workers leave their occupation, pat her on the head and breast, and stand on their hind legs, laying their fore-feet on each other's shoulders, and thus dance about her. Whenever she lays an egg, it is at once taken up by a worker and carried to a place of safety. Sometimes there are two or three queens in the nest, but they are all friendly and kind to each other.

Jenny. Does the queen never go out of the nest?

Ant. Never. It would be considered improper in the highest degree for her to do so. Indeed, no sooner is a female elected queen than she throws away her wings, of her own accord, and never stirs out afterwards.

Jenny. But what becomes of the males?

Ant. O, they die very soon after they come out. They are tender, helpless creatures, and the first rude wind or storm kills them.

Jenny. What is that upon the door-step?

Ant. O, I see. They have found a nice fat spider, which has been killed in some way, and they are going to take it to the nest for food.

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25. BUTTERFLIES AND MOTHS.

When spring is marching to the music of birds, and the leaves are unfolding to the warm sun, and the dandelions lift their golden heads in the growing grass, and the cows feed on sweet pastures, and yellow butter gathers in the churn, then come the butterflies.

Fluttering around the pools on the country road may be seen the boy's butterfly, with a set of bright, yellow wings, which many a boy seeks to imprison with his new straw hat. Thinking of the butter in the churn, it is easy to imagine how this butterfly came by its name. It is also called *colias*, and later in the season it will sport its wings among the blooming clover.

Yellow Butterfly—Colias.

From the common yellow butterfly the name easily passes to the great multitude of cousins, though they be brown, or black, or variegated in color. Many are their sizes as well as their colors, and different families have different shapes. When summer has fairly come, in our temperate climate, the swallow-tailed butterflies appear. A common one wears a rich dress of yellow

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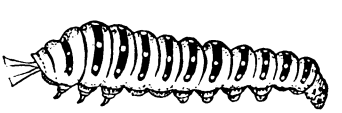
and black, and belongs to a family called *papilio*—quite a pretty name.

Moths, of which something particular will soon be said, are naturally thought of with butterflies. The common ones are clad in sober dress. Under the microscope, the wings of all butterflies and moths disclose beauties not seen by the naked eye. What commonly appears to be colored dust, and rubs off the wings under the touch of a finger, the microscope proves to be very fine, shiny, or irridescent scales. As if these wings had been sprinkled with powdered rainbow. Butterflies and moths, on this account, are called scale-winged insects.

When visiting flowers, the scale-winged insect is seeking its food, which is the sweet juice of flowers. It has a long, tubular tongue or proboscis, which is rolled up when not in use, and is unrolled and stretched out, when the bottom of a flower is to be reached.

The few weeks that Papilio lives are busy ones. When not gathering food she is finding the apple or wild thorn, perhaps, for a birthplace for her future children. She never sees her children. Very fortunate, you may think, when you come to know that her infants are ugly, crawling caterpillars.



Caterpillar of Papilio.

The truth is, that these ugly babes can take care of themselves from the moment they are born, if they are born in the right place. They are hatched from eggs, in some cases beautiful eggs, shaped like vases and caskets. These eggs are fastened to the leaves of

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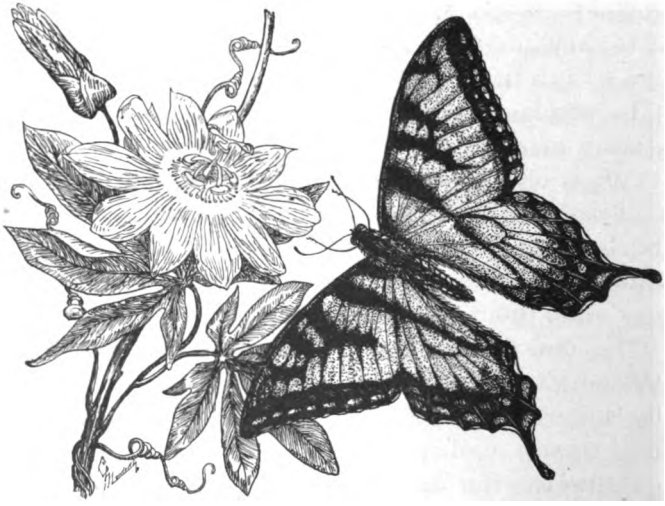
plants; and the mother, during her brief life, is seeking to deposit her treasures upon that particular plant which, after her caterpillar infants are hatched, will afford them their proper food.

Does the child resemble its mother? Look at both very carefully. The caterpillar is composed of thirteen rings joined together. The three main parts of



Swallow-tailed Butterfly—Papilio.

the butterfly's body show the traces of as many rings. The caterpillar has six jointed legs on three of the rings behind its head, quite like the six legs of its mother. These remain with it through life. The four pairs of legs on the rear part of its body—called pro-legs—are soft, and disappear after a while. The butterfly breathes through holes in its body as does the

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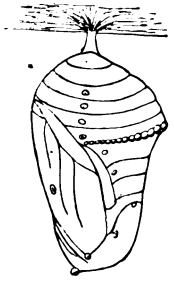
fly; so the caterpillar has breathing holes through which the air passes in to meet the blood.

The habits of the two are very different. The one flies, the other crawls. The mother sips nectar from flowers, and has a small stomach like a thread. The child is nearly all stomach, and feeds upon leaves. Its destructiveness may be judged by the enormous amount it eats. The first day of its life it eats twice its own weight. At the end of a month it may have eaten forty thousand times its weight. By this greediness it lays away a large store of fat.

To accommodate so rapid a growth, the caterpillar needs a new and larger suit of clothes, now and then. Its life is only a few weeks long, and during this time it changes its skin six times. The skin splits down the back and is shuffled off. The skins of some are smooth; of others are hairy, or covered with stiff bristles, to protect them against other insects and against birds.



Hanging Chrysalis.

After a time this ugly child of a beautiful mother ceases to eat. It abandons the green leaf of apple, or clover, or cabbage upon which it has been feeding, throws off its skin and the lining of its stomach, and becomes a pupa. Under its chin is a little spinner from which issues a silken thread. One papilio fastens its tail to a support and runs a silk thread around the middle of its body to hold it secure. Some kinds merely hang from the tail. In this state it remains from ten to fifteen days, and is called a chrysalis—which means gold-colored sheath—because some

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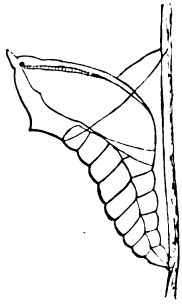
pupæ are surrounded by a case ornamented with golden spots, as if fastened with nails of gold.

Is the chrysalis a little coffin with a corpse within? No, indeed; there is a wonderful life in progress. Feelers, tongue, legs, and beautiful wings are growing. But what does this life feed upon? Ah! now we have found what that terribly greedy caterpillar was doing when it was eating up our leaves so outrageously. It was laying away fat which feeds the pupa in the chrysalis, as the hump supports the life of the camel when he is without his customary food.



Bound Chrysalis.

Well, in due time, if no enemy has torn it away, the chrysalis splits open and the imago, the perfect butterfly comes forth, dries its wings, and flies away full-grown. The ugly child is at last as beautiful as its mother, and as large as she; and it never grows any more.

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26. THE SILK-WORM.

BUTTERFLIES fly in the day-time; most moths fly by night. When the butterfly rests, its wings are raised over its back; when the moth lights, its wings remain flat and extended. Most moths have their wings joined. A bristle in the rib of the hind wing passes through a loop in the fore wing.

The antennæ of the butterfly stretch out nearly

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straight, and end in knobs; those of the moth curve, and in nearly all cases are without knobs. Butterfly-caterpillars spin a little; moth-caterpillars spin much more. Some of them make their pupa cases, or cocoons, entirely of silk.

Moths usually wear sober colors. Some are very gay and brilliant. Some are large, and others are very small. The great owl moth of Brazil measures nearly a foot between the tips of its wings. Our little clothes-moth expands scarcely a half inch. Some moth-caterpillars are smooth. Others are covered with bristles or spines; still others emit an offensive odor—all for protection against their enemies.

Moths are more destructive than butterflies. The clothes-moth feeds on woolen and furs. The canker worm eats the leaves of cherry, plum, and elm. The tussock-moth-caterpillar preys upon pear and apple trees. The fall web-worm allows very few trees to escape its mischievous horny jaws. The tomato-worm, the tobacco-worm, the cotton-worm are great destroyers. And all these so-called "worms" are the caterpillars of moths. There is one moth-caterpillar, however, whose destruction is turned to good account, and a short history of it must be given.

It is the mulberry silk-worm, so called because its favorite food is the mulberry-tree. Not our native tree of that name, but the imported white mulberry. Prof. Riley, of Washington, has, for nearly fifteen years, kept silk-worms on the leaves of the common osage orange; and their silk proved to be of excellent quality. This moth-caterpillar has a wonderful history, reaching back, it is thought, as far as two thousand years

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before Christ. China, now famous for its silk industry, is supposed to be its original home.

For thousands of years, so the story goes, the Chinese would not allow the eggs of their silk-moth to go out of the country. At length, about the year 550, two monks are said to have brought away to Europe a few eggs concealed in their canes. The silk-worm is now a purely domestic animal like the dog. So long, indeed, has it been fed by human hands, that it has lost the power of flight, and is wholly dependent on human care.

Though the cultivation of silk-worms occupies but a few months in the year, it requires great care. It can not be successfully conducted on a large scale. It is good work for women and aged people, while it brings a pleasant little income to add to the profits of the farmer.

Silk-worm Moth (after Riley.)

A single silk-moth lays about four hundred eggs, and an ounce of eggs will number about thirty-five thousand. During the winter the eggs are kept in proper boxes in the cellar. When the foliage is sufficiently started in the spring to furnish them food, the eggs are brought into a warm room—the silk-worm room—where they hatch in five or six days.

When about to hatch, the eggs are spread out upon a clean sheet of paper, and over them is laid a mosquito netting, on which are scattered fresh cut leaves

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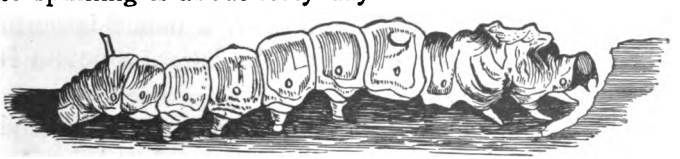
of mulberry. As soon as hatched, the worms crawl through the holes of the netting and begin to feed. They are then carried on the net to the table where they are to remain. A busy place is the silk-worm room, after life begins. The worms are fed twice a day.

The newly hatched caterpillar is black or gray, and is covered with long, stiff hairs. By and by it grows into a cream color, and its hairs disappear. It eats its own weight of leaves every day. During the few days before beginning to spin, it consumes more than during its whole previous existence. To make room for its rapid increase it changes its skin four times at intervals of from four to ten days. This experience in the silk-worm is called "sickness." The time from hatching to spinning is about forty days.



Silk-worm Caterpillar (after Riley).

When about to spin, the worm ceases to feed and throws out threads. The silk comes from a fluid within, which issues from a spinneret just beneath the lower lip. As the air strikes the fluid it hardens. First the worm throws around itself a loose silk called floss, as a sort of frame-work. Then within this it spins a tough, strong, continuous thread, not in circles, or round and round, but back and forth—in loops like a figure 8. A single cocoon may contain a thread four thousand yards long, or about two and a quarter miles long. The work occupies three or four days.

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Imagine how active the head of that creature must be during these few days.

The silken house thus made looks like a pea-nut. When it is finished, the worm once more puts off its old skin, which it packs into a wad, and crowds away in the end of the cocoon. Now it changes into a pupa, and so remains for two or three weeks.

When the cocoons are wanted for silk, as most of them are, and not for rearing moths for eggs, the pupa within is killed or choked by steam, or by setting the cocoons on a tray in an oven heated to a certain degree of temperature. After the operation of choking, the cocoons are dried in the air and are ready for reeling. It takes from three hundred to four hundred fresh cocoons, or three times as many choked cocoons, to weigh a pound. Of the former, a pound is worth about thirty-five cents, and of the latter, a pound is worth about one dollar.

The reeling of silk from the cocoons is a nice and delicate operation. When reeled, the product is known as raw silk, and is ready to be twisted into thread and to be woven into cloth.

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27. FACTS ABOUT INSECTS.

THE dragon-fly seen about ponds, darting here and there on four beautifully colored, gauze-like, net-veined wings, is by the French called demoiselle (dem wä-zel′) which means a young lady. Devil's darning-

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needle, and mosquito hawk are its popular names. The last name indicates a work these hawks do which ought to make friends for them. They never walk; they are always on the wing. Watch them closely and see how they dart from right to left in the air, apparently without moving their wings.

Crickets and grasshoppers will be associated together on account of their long, springing hind legs. The first pair of their wings are called wing-covers, because they cover the second pair which are folded under like fans. Their mouths are adapted to biting. The mole-cricket does not hop, and has forefeet shaped for burrowing, much like the digging-feet of the common mole. In the same group are included the katydid and the cockroach.

Dragon-fly.

The katydid, which utters its sleepy music, beginning about the middle of July, is pure green in color, like the foliage among which it hides. Both it and the cricket make their shrilling sound by rubbing together the wing-covers near the place where they join the body. These wings have heavy, rough veins.

Bugs are distinguished from other insects by a proboscis or beak, which is fitted to pierce the bark of plants or the skin of animals from which they derive their nourishment. Crickets are biters; bugs are piercers. Among the true bugs may be mentioned the aphis, or plant-louse; the chinch-bug, which is said to have cost the Illinois farmers four millions of dollars

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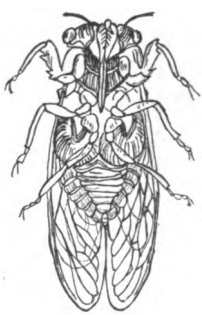
in a single year by destroying their crops; the lice that afflict human beings and birds; the bed-bug which infests pigeons, swallows, and human habitations. The last two offensive creatures have no wings, and the cockroach takes delight in destroying the larger insect of the two.

The cicada (cica'da) or harvest fly, improperly called locust, is a bug with a piercing beak which does also the work of a saw. This bug appears in the latter part of summer, when it produces a familiar sound by forcing the air into a ribbed or fluted kettle-drum situated in its abdomen. It bores holes in the twigs of trees to lay its eggs in. It is not particularly injurious.



Cicada—Under side.

Another cicada, called the seventeen-year-locust, appears in some parts of the country once in seventeen years; in other places once in thirteen years. It sometimes does great mischief. So deep does it bore into the apple-tree twigs that they fall off, and much fruit is lost. After the eggs are deposited, the parent dies and never sees its offspring. The young, when hatched, fall to the ground, and seem to know enough to burrow into the ground, where they remain during the many years of their quiet babyhood, living on the juices of roots.

Beetles are sheath-winged insects. Their fore-wings are horny in substance, and are used for wing-covers only, and not for flight. Beetles are biters and chewers, having for this purpose strong jaws, working, of

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course, horizontally. May-bugs, pinch-bugs, and potato-bugs, are not bugs, but are beetles.

One of the most interesting of this order of insects is the tumble-bug, which was held sacred by the Egyptians, and whose figure is inscribed on their monuments. Our tumble-bugs are nearly like it. The ball they roll, often up hill, one pulling and the other

Egyptian Tumble-bugs.

pushing, contains an egg. The little globe is composed of the droppings of horses and cattle; and this material seems to be selected because it will become heated, and thus help the egg to hatch. A hole is sunken in the ground to receive the ball, and to this nest the struggling little heroes are trying to move their rolling treasure.

The insect races are more numerous than the tribes or species of other animals. The number of different kinds of beetles, alone, which have been examined, is about a hundred thousand.

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PART 2.

FLIES have each but one pair of wings, and include gnats, mosquitoes, horse-flies, blue-bottle flies, and a host of others. The "blue-bottle" is larger than the house-fly, and is regarded as a pest and an enemy to the housekeeper and the butcher. Blue-bottle flies are attracted by the smell of meat, and manage to deposit their eggs upon this food, though it be covered with wire netting or with cloth. The eggs hatch in about twenty-four hours, and the larvæ are the maggots which are so detestable. However, this vexatious visitor does a great deal of good by helping to get rid of decaying animal matter.

How wonderful is the increase of flies! Mr. Keller, an English naturalist, has calculated that the early fly lays eighty eggs at each of four times during the season. The first generation after her lay four times; the second three times, the third once; and the offspring of these again deposit eggs, so that, should all the eggs hatch and produce flies, the original fly would be the parent and grand parent of two millions of children. Enemies and accidents must remove a great many of the eggs or of the young flies.

Many insects seek to deposit their eggs upon the substance that furnishes the proper food for the larvæ which are hatched from their eggs. For this reason the blue-bottle fly searches for meat; the potato-beetle finds the potato plant; and the moth of the tomato-worm deposits upon the tomato or the potato vine. Sometimes a mistake is made. A meat-eating insect

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has fastened its eggs to a plant which has the odor of meat, and the young, when hatched, died.

A lady in Missouri, who watches insects closely, found that a certain butterfly which deposits its eggs upon the wormwood plant, when this plant was scarce, selected a kind of artemisia, which in some respects resembles the wormwood. When the larvæ hatched they died of starvation, because the artemisia was not their proper food.

The tribe of insects, which includes bees and ants, embraces other kinds that attract attention. Never kill a wasp until you have seen the ingenious house she has built, and which she has covered with sixteen thicknesses of paper. Long before paper was invented, and when men were scratching their thoughts on bark and chips and skins, this little cousin of the bee and the ant was gathering the fiber of wood, chewing and spreading it out as thin as a letter sheet. The wasp was the first paper-maker.

Wait a moment while you dip your pen in ink. What is good black ink made of? One thing very necessary to it is an acid that is found in oak-galls. This acid is called gallic acid. What makes the oak-galls, or oak-apples, as they are commonly called? Toward the close of the growing season, our red oak sometimes bears a large number of these galls. The galls that help to make the best ink come from China.

The gall is not a natural fruit of the oak, but is produced by an insect; in some cases by an aphis or louse, in other cases by a gall-fly which is cousin to the wasp. This insect stings the oak-twig to make a place for its egg. Around this wound with an egg in

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it, the tree produces an apple-like swelling in which the sap turns to an acid. The gall-fly, therefore, is the ink-maker, as the wasp is the paper-maker.

The sting of the stinging insects, such as bees, wasps, and so forth, is at the end of the abdomen. The same organ is used to deposit the eggs. The wasp saves her sting after inflicting a wound; the bee usually leaves her sting in the wound and then dies, because the sting takes away a part of her bowels. A very intelligent gentleman has found that the wasp fails to make a painful sting if, when she begins to pierce the skin, he holds his breath. This experiment can easily be tried by stirring up a wasp's nest.

PART 3.

THE agricultural ants of Texas have been patiently and carefully watched by Rev. Mr. McCook. These ants clear away the weeds and grass from a piece of ground seven to twelve feet in diameter. Nothing is permitted to grow on the cleared space, or disk, except a needle-grass which is called ant-rice. This plant they allow to grow, that they may gather the seed which it bears, and store it away in their underground galleries for winter use. On this account they are called harvesting ants, and they fulfill the words of King Solomon: "The ants are a people not strong, yet they prepare their meat in summer."

For such very insignificant creatures that are only about a half inch long, the clearing of this farm is a tremendous work. But they work together, and they work with a will. With their jaws they cut, pinch,

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Agricultural Ants.

pull, twist, and tear. Sometimes one climbs to the top of a weed and bends it over by her weight, while another cuts it off near the ground. When bearing their burdens along the roads which they make, one does not turn out to let his fellow pass, but walks right over him. Among themselves they never quarrel. They help one another out of difficulties. They work a while and then rest. When eating they sometimes sit up like squirrels.

Much time is spent by them in combing and clean-

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ing themselves. One ant cleans its fellow. It lifts the fellow's leg and licks it; then licks the fellow's head and neck; then the breast. Then the cleaner goes away—the fellow cleansed "all this time," says Mr. McCook, "seeming pleased as a dog when his back is scratched."

Ants talk by signs. When a slave-making ant is hungry, it will pat the head of its slave with its feelers; then the servant immediately supplies the wants of its mistress. The sign for marching is a tap on the side. The red ants will sometimes starve rather than help themselves. Some ants, therefore, are sluggards; and it was not to these, but to the harvesting ant that Solomon bid the human sluggard go.

Ants are very strong, and a single one will carry in its jaws a burden twenty-five times its own weight. Ants have their seasons of play, when they jump, caper, and dance on their hind legs. They wrestle, and carry one another in their mouths.

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28. AMONG THE FISHES.

WHEN one steps into the water and finds how easily he sinks, the swimming of fishes seems a little mysterious. The puzzle arises, not when the swimmers are in motion, for we ourselves can swim by the proper use of arms and legs. The fish at rest, with motionless fins and tail, as if standing in the water—this is what we wonder at.

The puzzle is far from being a knotty one. The boy is much heavier than the amount of water which

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his body displaces. Not so with the fish. Its weight is much more nearly as light as the water in which it swims. Then there is the swimming bladder, which young fishers find within the fish, lying just under the backbone. This connects with the mouth, and is filled with air or emptied, at the will of the fish. Hence it is quite easy for the finny creature to rise or drop in the water, and to stand still, with little or no motion of the fins.

A common river-chub must be called up here that the names of fins and other parts may be learned. Behind the head are the pectoral fins (*pf*), one on

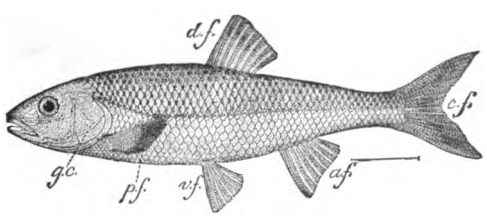

Fig. 11. Common Chub.

each side. Still further back and below are the ventral fins(*vf*), another pair. These pectoral and ventral fins correspond to the arms and legs of human creatures, or to the fore and hind legs of quadrupeds. On the back is the dorsal fin (*df*). Some fishes have two dorsal fins. On the under side near the tail hangs the anal fin (*af*). Then comes the tail, or caudal fin (*cf*).

The pectoral and ventral fins enable the fish to balance itself so as not to turn over on its side. The dorsal and anal fins keep it in a straight line when it moves, while the tail fin is the oar or scull, which works from side to side, and makes the fish go. The

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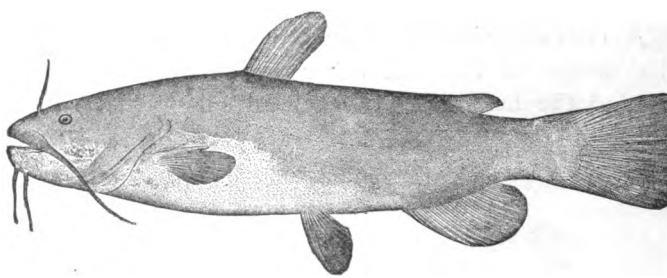
eye has no lid. The nostrils are a little in front of the eyes. The ears—where are they? Fishes hear, because gold-fishes kept in ponds are trained to come to their meals at the ringing of a little bell.

Some fishes make noises, evidently for the purpose of calling their mates. The cat-fish utters a gentle, humming sound, perhaps to call its young; for it broods its young as a hen broods her chickens. Fish



Bull-head.

have organs for hearing, and these are near the back of the head. They are covered—not open; and the hearing nerve connects with the air-bladder, as if to carry sound through the body. The sense of touch is in the lips. Bull-heads and cat-fish have long barbels hanging from the sides of their mouths. Quite likely these are feelers like the whiskers of a cat. From this resemblance the cat-fish gets its name.

On the side of the head is the gill cover (*gc*). You may watch its motion in the gold-fish or the minnow. The gills within are so arranged as to bring the cold red blood of the fish in contact with the air which is mixed in the water. The water passes in at the mouth, over the gills, and out under the gill

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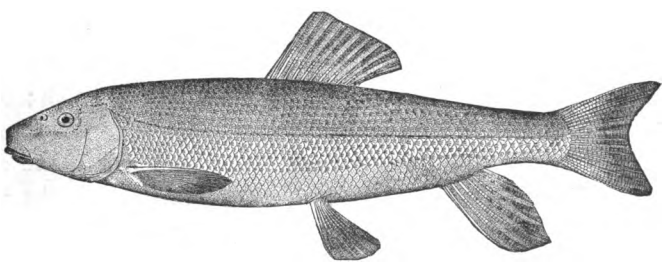
covers. This is the way in which the fish breathes. Some kinds of fish have teeth in the jaws, while others are toothless. Their food is mostly worms, insects, and other fish; though some, like the pond-carp, feed on vegetable matter. The mode of eating is to swallow the food whole; and this explains the reason why fish may be caught with a hook. No fish would be apt to swallow a hook after chewing it.



Sucker.

The fish impresses us as a bony animal, indeed very bony. It has a backbone, and its skeleton is inside of its soft parts instead of outside, as is the case with insects. Nothing is easier than to examine the skeleton of a fish when it lies on the dinner-plate.

PART 2.

THE scientific and sporting books have a way of speaking slightingly of certain fishes as "boys' fish." Thus they put aside the common sucker as "one of the numerous tribe of boys' fish which may be found on every urchin's string." Here is a list of the boys' fish: Minnows, chubs, roach, dace, shiners, and suck-

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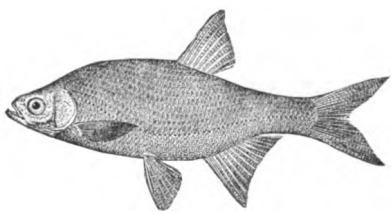
ers. These are popular with boys, and with girls, too, because they may be found in small streams and ponds, where there is slight danger of being drowned. They bite readily, and when caught, are easily handled, because they have no teeth in the mouth, and their fins are soft.



Shiner.

The boys' list, it must be confessed, are all poor eating. Thoreau says, "the chub is a soft fish; it tastes like a piece of brown paper salted." Without doubt this is the solemn truth; but who can make a boy believe it, particularly if he has himself caught a chub? The first fish I ever caught was a beautiful silver shiner about six inches long. All these small, soft fish seem to have bones mixed up with their flesh as if to stiffen their sides, like corsets. When my little shiner was cooked and on my plate, I found it terribly full of bones. Nevertheless, no one could convince me that it was not the most delicious morsel in the world.

When the young fisherman or fisherwoman finds a sunfish (pumpkin seed) taken by the hook, then the boys' list is left behind, and something like the "game fish" is reached. A game fish is one which makes good eating, bites vigorously, and, when once hooked, resists so earnestly as to make the catching exciting. The little, nearly round sunfish is one of a group of cousins which includes the yellow perch, the log-perch or rock-perch, and all other perches; the yellow bass, the white bass, the black bass, the striped bass of the sea, and

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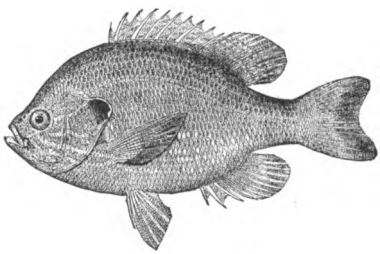
the delicious crappie of the Mississippi River. You will notice that all these fishes have on the back, in front of the usual dorsal fin, a first dorsal fin composed of very sharp spines. You will be more impressed with the sharpness of these fins when you come to take a bold, wriggling, spiny fish off your hook. Look out for the spines!



Sunfish.

Another company of cousins is the salmon family. They have soft fins but fierce teeth. The great salmon, which run up the large rivers from the sea to deposit their eggs in small streams so that the young fry may be far away from their enemies—these are called the monarchs among all game fish. No cat can climb a tree more nimbly than a salmon will shoot up the rapids, or leap up a rushing fall of water. With the salmon belong the lake trout, the white fish of the Great Lakes, and the exquisite brook, or speckled trout. These fish are without the large scales which belong to most fresh-water fish.

The little bull-head with its barbels hanging from its lips, and with a head nearly as large as the remainder of its body, is a near relative of the different kinds of cat-fishes which inhabit rivers, lakes, and sea. The cat-fish of the Mississippi often weighs a hundred and fifty pounds.

The cat-fish of Central Europe weighs as high as four hundred pounds. Cat-fish are all hungry, barbarous, and

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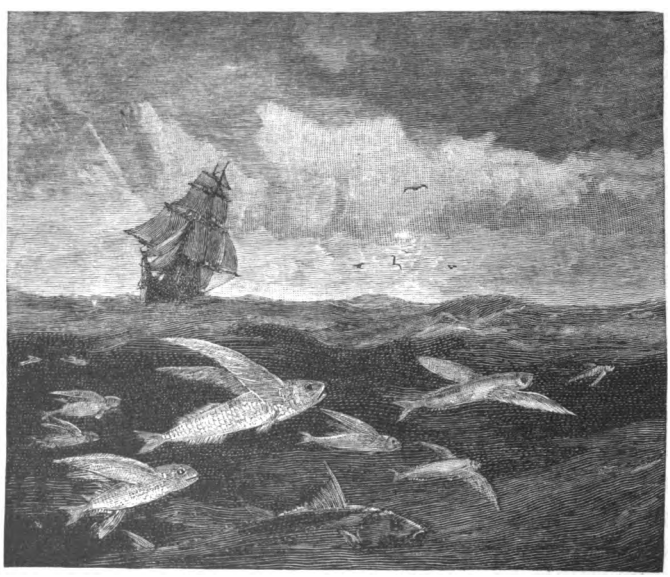
cruel; and scarcely any fish escapes their jaws, except the spiny perch family. Of the European cat, great fish stories are told. One was said to have swallowed a woman with a ring and a purse of gold. An apparently true account, however, states that on the 3d of July, 1700, a cat-fish was caught at Thorn, Prussia, in the stomach of which a small child was found. But



California Flying-fish.

none of these stories need alarm the young fisher of bull-head or pout.

In mudholes and ponds in the country, are sometimes seen worms which look like animated horse-hairs. Country boys are sometimes told that these wriggling swimmers actually come from horse hairs accident-

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ally dropped in the water. A still more foolish story is that eels grow from hair-worms. The truth is that the hair-worm comes from an egg, like other worms, and the eel is a real fish. A strange sort of fish, undoubtedly. It has the head of a fish, though without gill covers, and it has also a pectoral fin. Its dorsal and anal fins run along nearly one third of the body. Eels are found most abundantly in those waters which communicate with the sea.

The flying-fish and the stickleback must have a word. The former, to escape its pursuing enemy, with a spring of its tail, leaps into the air. Its pectoral fins, you observe, are developed something like wings. The California flyer "flies for a distance sometimes of nearly a quarter of a mile, usually not rising more than four feet. When on the wing it resembles a large dragon-fly."

The little sticklebacks are found in some rivers on the Atlantic coast. The black bass is one of the few fishes that take any care of their young. It builds a saucer-like nest on the bottom, where the eggs are deposited, and where, when hatched, the fry are carefully protected. But the stickleback builds a nest somewhat like that of a bird. The male gathers weeds and erects a barrel-shaped house. He secretes a marvelous kind of mucous in his body, which, as soon as it comes in contact with the water, grows firm and hard. With this he cements his nest. Sticklebacks, on account of this interesting architecture, are sometimes confined in aquariums. Their nests in the water are often the subjects of pleasant pictures.

Stickleback.

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29. ROMAN FISH PONDS.

EELS are to the sea what hawks and owls are to the air. They are the terror of most other fish, and they attack their prey by day and by night. Hidden in the mud or beneath some overhanging rock, they dart out with open mouths and with great fury. The murry eel abounds in the Mediterranean Sea, and in nearly all warm seas. It does not hesitate, when opportunity offers, to satisfy its appetite by attacking human flesh. This fact shows that the story of Pollio, which is here given nearly in the words of Mr. Houghton, is quite probable.

Red mullet and murries seem to have been special favorites with the old Romans like Hortensius, "those blessed fish-pond gentlemen," of whom Cicero speaks with contempt. The murry was highly esteemed for the delicacy of its flesh, and for its fine flavor. These murries would become so tame that they would come at their master's call, and take food from his hand. Hortensius actually shed bitter tears when a favorite murry died in his ponds.

Another celebrated Roman, named Crassus, had an equally tender heart. He could not stop his tears at the death of his fishy darling. But he had a ready wit as well as a soft heart. When his brother-senator, Domitius, called "Brazen-head," twitted him in the Senate for having cried as much at the death of an eel as if he had lost a daughter, Crassus replied that it was more than old Brazen-head had done for any one of his deceased wives!

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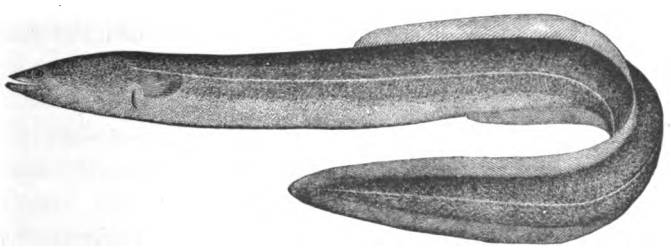
Varro, a Roman writer, says: "A friend of mine, Hortensius by name, had fish ponds at Bauli, constructed at great cost. I have often been with him at his residence, and I know that, instead of eating his own fish, he would send to Puteoli and buy fish. He used to feed the fish with his own hands, and would show a great deal more anxiety, if his mullets were hungry, than I showed when my asses wanted feeding. I am content with one slave to feed my asses. Hortensius employs a host of fishermen who are con-



Common Eel.

tinually sent out to catch heaps of little fish for big ones to eat. He felt more anxiety about a sick fish than about a sick slave."

Murries are the fish which, according to Pliny and others, a certain Roman knight named Pollio kept. Pollio was a friend of the Emperor Augustus. He used to feed his fish with human flesh. One reason for this terrible practice was that he was unfortunate with his slaves. When they were waiting on his table they were careless or clumsy, breaking dishes, or upsetting decanters and other tableware. If a servant of Pollio was so unfortunate as to break a valuable piece of glass or crockery, he would have to pay the pen-

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alty, then and there, by being thrown into the fish-pond. This was the order:

> Whoever breaks the glass or dishes,
> That man becomes the food of fishes.

Well, on one occasion the Emperor Augustus came to sup with Pollio, when he was, of course, richly entertained. The best dishes, the finest vases, the best wine appeared on the table. As might be expected in the presence of an emperor, the servants behaved with propriety, and no accident at first happened.

The fish went off swimmingly, and so did the rest of the dinner; but not so the dessert. An unlucky servant made a slip and broke a crystal goblet; whereupon his master ordered the offender to be at once delivered over to the pet murries, in the very presence of the emperor.

The man knew his doom; so he fell at Augustus' feet and begged him to intercede in his behalf with his master. He did not fear to die—it was not altogether that; but he thought it hard that a man, though a slave, should be gobbled up or nibbled to pieces by fish.

But Pollio would not listen even to the emperor; whereupon Augustus very properly took the matter into his own hands. He pardoned the slave and set him at liberty; ordered all Pollio's glass and china to be smashed, and his fish ponds to be filled up. I suppose the emperor made it up with Pollio soon after this affair. At any rate, it is stated that when Pollio died, he left a large part of his property to Augustus.

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30. "I GO A FISHING."

So said Simon Peter. And the seven other disciples said, "We also go with thee." Some of these disciples, when Jesus first met them, had been fishing, and were then mending their nets. They left their nets and boats to follow him, but it seems that they occasionally repaired to the Sea of Galilee to go a fishing, for the purpose of getting necessary food and for recreation or sport.

If the fish in this sea were of the same varieties that abound there now, we may know something about those which Simon Peter and his friends caught. Dr. Tristam, visiting Palestine in 1863, collected from the Sea of Galilee fifteen species of fishes. One kind was nearly like our bream or shiner, only much larger. Other species resembled the cat-fish in having barbels hanging from a large snout, but differed from the cat-fish in being clothed with large scales. Another was a species of eel, without scales, and of a black color.

The fish of the Sea of Galilee are now, as they were eighteen hundred years ago, exceedingly abundant. In ancient times they were caught with a net; probably never with a hook. Dr. Tristam witnessed the present method of taking them. "An old Arab sat on a long cliff and threw poisoned bread crumbs as far as he could reach; which the fish seized, and turning over dead, were washed ashore and collected for market."

The shoals presented a marvelous sight, for many hundred yards black with the masses of fish, the back fins projecting out of the water as thickly as they could be

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crowded. It is no wonder, then, that in ancient times the net broke on account of the multitude of fishes. When the net was drawn ashore, the fish were sorted. They gathered the good into vessels, but cast the bad away. We know pretty well what the "bad" were; they were the eel-like fish, which were forbidden by the Jewish law to be used as food, because they had no scales. (Lev. xi:10).

It is likely that the hook is older than the net. There are evidences that savages, long before history was written, used fish-hooks made from the bones of animals, and even from the jaw-bone of the human head. From the remote ages until now, the spear has been used in clear waters for killing fish. The ancient Egyptians made hooks of bronze, and our Saxon ancestors made hooks from flints. The ancient Scythians practiced a droll method of catching the great cat-fish in the river Danube. The fisherman drove a pair of oxen to a convenient point on the river bank and set them at feeding.

He laid the yoke down near the edge of the water, fastening a rope to it. To the other end of the rope a strong hook was attached, baited with liver and weighted with a sufficiently heavy sinker. The hook was then cast into the middle of the stream. By and by a huge fish finds the bull's meat, which he dearly loves, opens his immense jaws, swallows the morsel and starts off on his course as many another poor glutton of a fish has done.

The fisherman observes this performance with delight; jumps to his feet; yokes his oxen, and then there is a great contest between the strength of two

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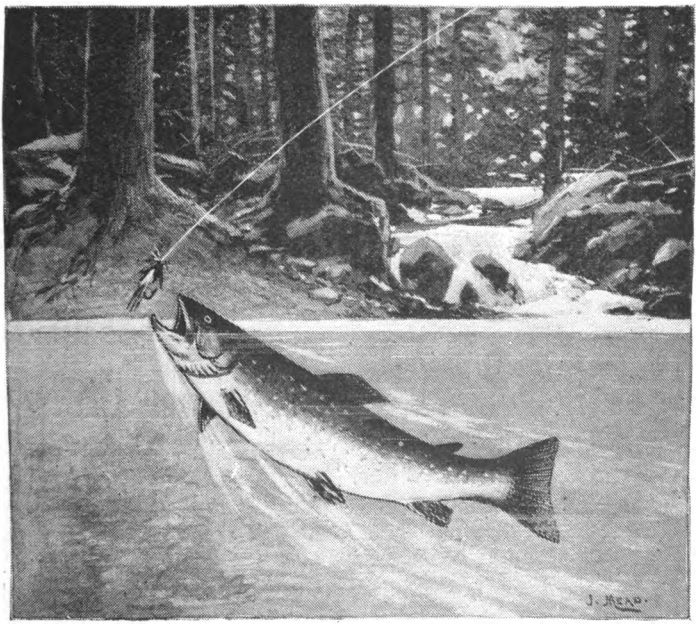
oxen and one immensely powerful fish. The oxen, of course, prevail, and the monster is drawn ashore.

In these days, the fisherman is assisted by a multitude of devices. From the net or the seine to the pin-hook of the child, there are hooks of all sizes and pat-



Speckled Trout.

terns; lines of linen and lines of silk; no end of snells, bobs, flies, and jugs for cat-fishing; poles of bamboo and costly woods, reels and scoop-nets. Game fish are taken with worms, minnows, and flies natural and artificial. But successful fishing is in the skill of the fisher as much as in the fine tackle he uses. To catch

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a brook-trout is "to cast a fly gracefully, so that it will fall in the right place like a snow-flake or a winged insect," and when he is hooked, to land him.

Says the good Isaak Walton, "God never did make a more calm, quiet, innocent recreation than angling." We all need, like Simon Peter, to go a fishing—old and young, girls and boys. Another "brother of the angle" says, "Sometimes the parents take the children a fishing. Whenever they do, they should supply them with a light bamboo rod, and attach at a joint one third from the top end a fine silk or linen line; then affix a float according to the depth of the water, so that the bait will sink within six inches of the bottom, and a foot above the hook fasten to the line from one to three split shot.

"Let the hook be of the minnow size, and let the bait, dug the day previous and laid in moss or grass over night, merely cover the point of the hook. Never bait with the head of a worm; always break that off and throw it in the water."

"I love to see the man of care
Take pleasure in a toy;
I love to see him row or ride,
And tread the grass with joy,
Or throw the circling salmon fly
As lusty as a boy.

"The road of life is hard enough,
Bestrewn with slag and thorn;
I would not mock the simplest joy
That makes it less forlorn,
But fill its evening path with flowers
As fresh as those of morn."

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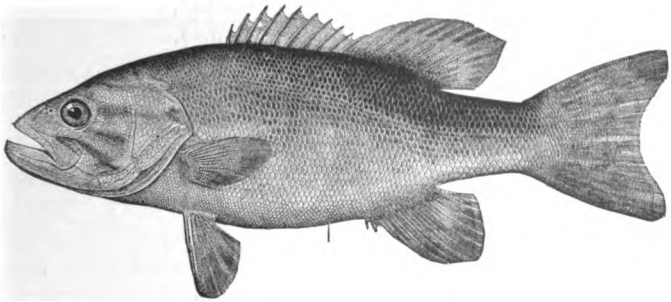
31. ANOTHER VIEW OF FISHING.

THERE are some people who conscientiously think that fishing is a cruel amusement. While we should never, needlessly, inflict pain upon any living creature, it is well to reflect that the world of fish is any thing but a paradise of peace. It is a scene of constant war and fighting. Fish have no sympathy or tenderness. Big fish eat little fish when they can catch them. Great fish enter into combats, one with an-



Black Bass.

other, like fierce tigers. Even pet fish in the aquarium occasionally turn on their companions and devour them.

It is well, also, to know that all cold-blooded animals have no very keen sense of pain, and that the water-breathing fish, jerked into the air, dies by air-drowning as easily as an air-breathing animal dies by water-drowning. There are some who think fishing an idle and foolish amusement. Such will take comfort from Dr. Samuel Johnson, a distinguished English

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writer of a hundred years ago, who describes fishing as "a stick and a string with a fool at one end and a worm at the other." For the comfort of such the verses of Dr. Walcott may be quoted, who thus addresses the innocent fish, without hooking him:

"O harmless tenant of the flood,
I do not wish to spill thy blood;
For nature unto thee
Perchance has given a tender wife,
And children dear, to charm thy life,
As she hath done to me.

"Enjoy thy stream, O harmless fish,
And when an angler, for his dish,
Through gluttony's vile sin
Attempts—a wretch—to pull thee *out*,
God give thee strength, O gentle trout,
To pull the rascal *in!*"

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32. TOADS AND FROGS.

THE toad, named Bufo, is a droll, humorous, waggish fellow. He has no visible means of defense. He can not bite, for he has no teeth. He can not scratch, for he has no claws. Yet he comes out at night-fall, and looks you in the eye as if he were conscious of his safety. It is observed that neither the cat nor the dog will touch him. This is because from some glands behind his head, he sends forth a fluid which is biting and offensive, though not poisonous.

There is a real sense of fun in Bufo. He will play

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Common Toad.

with sticks, throwing them about. He snaps in fire-flies with his darting tongue, and he has been known to appropriate lighted matches in the same way. He fills himself with stinging bees, and seems to regard the performance with great satisfaction. He has been tamed, and taught to come at the call of his name. A toad was once kept as a pet for thirty-six years, and knew all his friends.

Some slight differences are noted between Bufo and his cousin Rana, the bull-frog. Bufo is covered with warts, Rana has a smooth skin; he also has teeth on his upper jaw. Each has four fingers in front and five toes behind. The tongue in both is fastened at the front of the jaw, and is free behind; so that it can roll

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out and catch an insect by the aid of a sticky gum which it carries, and then turn back with its prize, so quickly as scarcely to be seen.

Tree-toad.

Of frogs, the tree-frog, the pond-frog, and the bull-frog are most familiar. The little tree-frog, or tree-toad, is hard to find, because his color is so much like the bark and foliage of the tree. His toes are remarkable. They end in cups or suckers, by which the little climber is able to cleave to the tree. Tree-toads are good weather prophets, and in Germany are sometimes used for barometers.

This instrument is, mainly, a glass tube, in which mercury rises and falls according to the pressure of the atmosphere. In a similar way a long or high bottle is furnished with a very small ladder. Tree-toad is put in the bottle, and climbs up or down the ladder according to the pressure of the atmosphere.

The bull-frog lives in quiet waters where, in early summer, he tunes his instrument—a violoncello, perhaps. You may hear him snapping the strings, and then rolling out his roaring bass notes. Some people detect in his notes the words, "Bloody thunder! bloody thunder!" The hind legs of Rana are regarded as very delicate food.

Toads and frogs, when stripped of skin and flesh,

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show a skeleton much like ours. But they have no ribs. Our ribs act in such a way as to fill our lungs, and enable us to breathe. Frogs and toads breathe in a different manner. They take a mouthful of air, then close the mouth and nostrils, and swallow the air. They breathe partly through the skin. The way to smother a man is to stop his mouth and nose. The

Bull-frog.

way to smother a frog is to keep his mouth and nose open. A frog, though, has been known to live forty days by breathing through his skin, after his lungs had been taken out.

What a marvelous nursery and cradle is the water in which are born and reared so many tender things, some of which never again return to this home of their babyhood, when once set free in the air or on

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the ground! Here the toads and frogs pass through some wonderful changes from the egg to the complete form. These changes are easily seen and watched in the aquarium.

The eggs, or spawn, are laid in a kind of jelly, which fastens them to a stick or plant in or very near the water (1). After about a month the eggs hatch, when

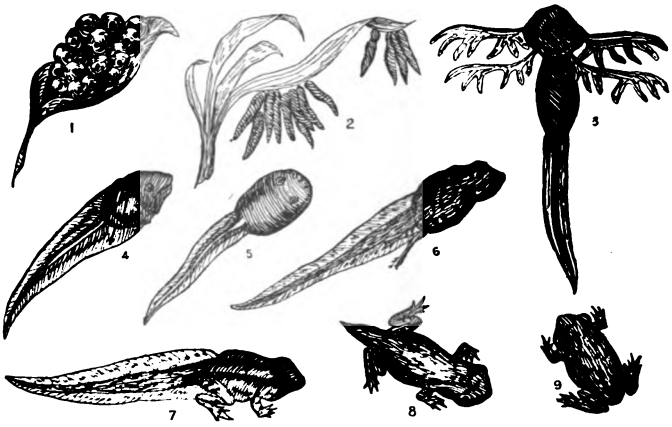

Fig. 12. Eggs, Tadpoles, and Frogs.

there appear very small tadpoles, with head and tail, and a pair of holders behind the mouth (2). Outside gills grow, and become large, like plumes (3). You remember for what purpose are gills in the clam and oyster. Then the gills disappear (4—back view 5). Hind legs put forth (6). Fore legs follow (7). As the legs grow, the tail shrinks away (8). The tail goes, and the perfect little frog comes (9).

All this time changes have been going on within the tadpole. When the outside gills passed away, inside

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gills, like those of the fish, came. As these disappeared, lungs took their place. When all the changes are accomplished, the little frogs are ready, with the first warm rain, to start out and try the land. Sometimes they hop a long distance from their watery nursery, and people who know nothing of their history, think they have rained down.

During winter, frogs lie buried in the mud-bottom of a pond. Toads hide themselves in similar places, or under stones. All have musical voices, which repeated attention will enable one to distinguish, so as to tell which is that of the toad, which is the frog's, and which is the tree-toad's. The bull-frog's double bass no one can mistake. At the close of winter and frost, the trilling notes from the ponds are a pleasant announcement of spring.

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33. SNAKES.

THE dread of snakes is common to many animals, to monkeys and to human beings. Children, and monkeys raised in cages, on the first sight of snakes shrink from them with terror. Pigs do not mind them. This dread comes partly from ignorance about snakes, and partly from the fact that some snakes inflict a deadly wound. Pigs are not injured by poisonous reptiles.

If we knew more about these creatures they would not excite our fears so much. Some people are almost

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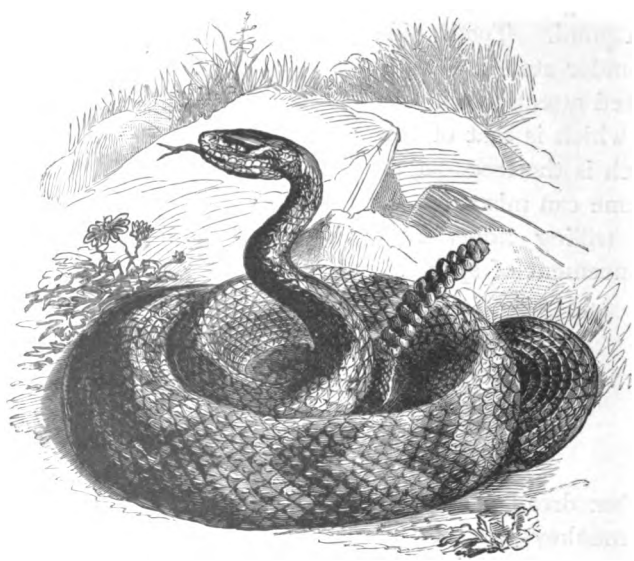
as badly frightened by mice and beetles, as by snakes. One peculiarity of these creepers, which makes them dreadful, is that they move so obscurely and silently in the grass. Then they are cold-blooded like toads, and the touch of them is not agreeable. On the other hand, snakes are useful, as their bill of fare shows, and they are truly beautiful. The scaly, many-colored, and



Rattlesnake.

glistening skin of some of them is as handsome as the feathered garb of beautiful birds.

The movements of snakes are graceful. The backbone of some snakes is composed of more than three hundred parts; and to each of these parts is attached a pair of ribs. How quickly and easily it turns and coils

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its supple body! How mighty is the coil of the python that will kill a deer!

The snake has no feet, as feet are commonly understood. It moves by its backbone and by its ribs. On the under side of the body are scales, one of which is joined to each pair of ribs. The pairs of ribs move forward and backward, and the scales attached to them catch on the rough ground with each motion. This operation gives the animal its gliding gait. The snake is adapted to swimming, and to climbing trees, but it would make bad work trying to crawl on glass.

The bones in the head of the snake are joined by elastic ligaments, so that it is able to swallow animals much larger than its head appears to be. Snakes never chew their food, but swallow it whole. Their eyes have no eyelids. Their hearing is dull. All snakes are as "deaf as an adder." The forked tongue is the feeler—nothing else. There is no harm in it. The teeth are simply for holding the prey; not for chewing. There is no poison in them, and their bite is harmless.

In temperate climates, snakes lie torpid during the winter. When active, they, like all other animals, are seeking for food. The common ones are after insects, frogs, mice, rabbits, fish, and birds. They have no power to charm animals. Snakes either catch their prey and immediately swallow it, or they wind their coils about it, as do black-snakes and boa-constrictors; or they thrust poison fangs into it, and thus cause its death. No snake, not even the python or the boa, seeks human flesh for food. Neither threaten nor harm a snake, and, as a rule, it will let you alone.

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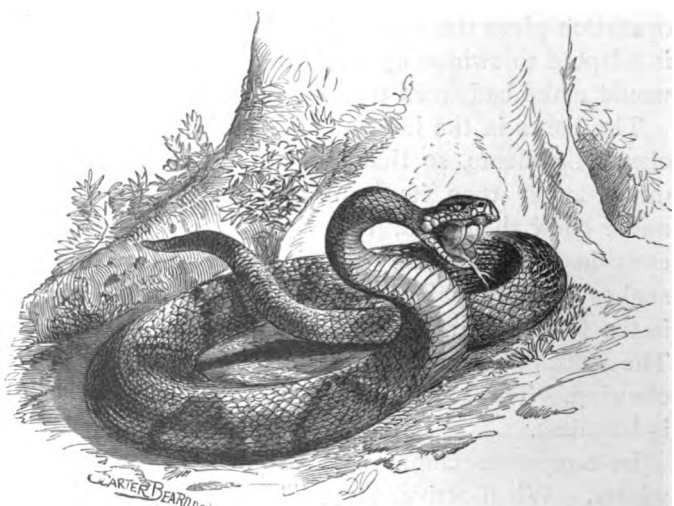
In our country there are three, and only three kinds of snakes that inflict injury on human beings. These are the snakes that have poisonous fangs. The fangs are entirely distinct from the small holding-teeth. They turn back upon the upper jaw, when not in use; and are thrust forward, when the snake is about to strike. A sac at the root of the fang contains the poison,



Copperhead.

which is sent down a groove or canal in the fang and thrown into the wound, at the will of the snake. Poisonous serpents sometimes bite without using the poison.

The three kinds of venomous snakes are the rattlesnake, the copperhead, and the water-moccasin of the South. These have the poison fangs. No others have

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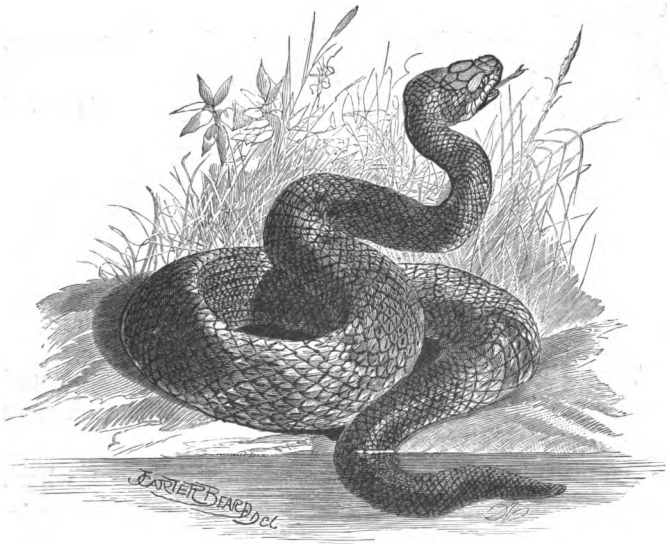
them. You may handle grass snakes, milk snakes, spreading adders and racers, and none of them can do you serious harm. The bite of most of them is scarcely more than the prick of a pin-point.

In some Northern and Southern states the rattlesnake is black, and is called massasauga. Elsewhere it is usu-



Moccasin.

ally more or less distinctly spotted. In the Southern States it is adorned by diamond-shaped spots, and is called the diamond rattler. The Oregon rattlesnake has round spots; while that of many states is called the banded rattlesnake.

The number of rattles on the tail indicates nothing in regard to the age of the animal. The use of the rattle

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has been a good deal of a puzzle. The copperhead resides in a more southern latitude. It has a dark brown head, and reddish spots on its body. I have several times met it, and have killed it, but never saw it show a very fighting disposition. The water-moccasin is olive brown in color, and is more dreaded than all others, because it is more irritable, and more disposed to attack.

The young of all serpents are produced from eggs. At regular periods snakes slough, or throw off, their skins, a bright new covering taking the place of the old garment.

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34. HOW A TURTLE TAUGHT A LESSON.

THE following sketch by Mr. E. S. Thayer appeared some years since in *St. Nicholas*, and is inserted here by permission.

About thirty years ago, there was a little boy whose name was John—a pretty boy, with thick, golden hair, large, brown eyes, red cheeks, and freckles. One day, in summer, he was playing by the side of a brook in one of the pastures near his home in the country. The brook resembled the boy in some respects. It was in its first light-hearted youth, and went on its way, leaping and sporting.

This active little boy first built a dam of moss and turf and stones; then he rolled up his trousers and sailed his little schooner-rigged boat; and, finally,

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waded aimlessly over the smooth sand through the cool, running water, dashing the sparkling drops to right and left with his frisky feet. In this way, he came to a large, flat rock, over a portion of whose smooth surface the stream flowed in a broad, crystal current.

A mud-turtle sat on the rock, half out of the water, enjoying the pleasant sunshine, apparently as contented and happy as a turtle could be. But when he saw the boy splashing along at such a rate, he thought it high time to be gone; perhaps he had previously had experience of the tender mercies of boys, for he made great haste to reach the protecting mud of the bank.

"Ah, ha, you rogue! you think you can get away, do you?" shouted the youngster. The next instant he was kneeling on the slippery rock, with both hands outstretched over the prisoner. John had been carrying his shoes—his stockings stuffed into them—with one hand; but now, in his eagerness to secure the turtle, he dropped them upon a part of the rock covered by the stream, and, turning sideways as they fell, the water rushed in, filling them to the very toes.

"There!" exclaimed John, half in real and half in affected vexation, "you have made me get my stockings wet, and you must be punished for it. I shall turn you over on your back, and you may stay there, sir, until I come back from school to-night."

That night, John came home from school, with a group of school-fellows, over the village road, instead of across the pasture, forgetting all about the turtle he had left on the rock. Vacation began the next day, and John was to spend a whole month with his

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brother who lived in Boston. You can understand the excitement which attends a boy's preparations for his first journey; but a country boy's first visit to Boston exceeds, perhaps, any experience of yours in that line.

The month passed swiftly away, and John returned home with brighter eyes and prouder step. The world had been revealed to him on a broader scale. What had he not seen? He was a hero in the opinion of his school-mates. He had enough stories to tell of his adventures to last through the winter.

If possible, he was a merrier boy than before, who now bounded through the dear old pasture. There were several dams visited by their young proprietor, one somewhat extensive, with a miniature water-wheel and mill at the side. The dam had been partially washed away by a violent rain, and an accumulation of moss had clogged the wheel of the mill. "Ah! I see there has been a freshet, and my mill is damaged. These freshets are terrible things for manufacturers, I declare!"

Leaving the scene of this disaster, he approached the smooth, white rock, which was always a favorite resort, and near which, on the bank of the stream, there was a structure of brick about two feet high, which this young man called "my summer residence on the Hudson."

Six yards from the rock, he suddenly paused, with his eyes intently fixed upon some object before him. Step by step, he drew nearer without once moving his eyes, which were now full of horror mingled with a hopeful doubt; but as he proceeded, the doubt van-

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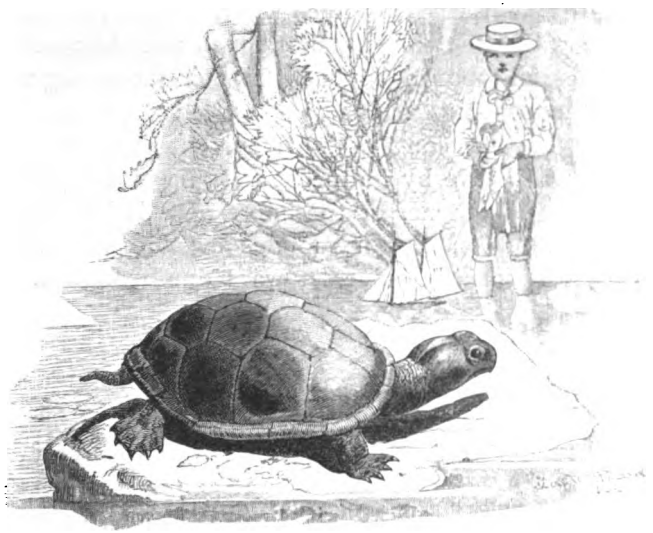

John and the Mud-turtle.

ished, and the horror spread over his whole countenance. There lay the turtle on the rock, upon its back, as he had left it—its extended legs and head shriveled and dry, scorched by the blazing suns of four August weeks.

There was no need of gentle pity now—no opportunity for showing humane kindness to a dumb, harmless creature. No more would it gladly hide itself in the protecting earth, or hasten in fright from the dreaded hand. What vain struggles to regain its feet! What weariness and despair! What agony when the noon suns beat down! What pangs of slow starvation! As all this passed through John's mind, the rock seemed no longer the old, familiar spot.

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With pallid face he turned away, and hurried home in the gathered twilight, nor stopped until he reached the cheerful room in which his mother sat sewing and his father reading.

That boy has long been a man, but the years that have passed have by no means worn away the remembrance of this scene, or the impressions it left on his mind. And on that memorable evening John took his first lesson in kindness toward dumb animals.

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35. THE BOX-TORTOISE AND ITS KIN.

THE tortoise, or turtle, is appropriately called "an animal in a box." It is an animal with a backbone; and a most singular specimen of the backboned or vertebrate animals it is. Insects, as we saw, have their skeletons on the outside, and their soft parts—flesh and so forth—inside. The backboned animal, in nearly all cases, has its skeleton of bone within, and its soft parts without. But here is an animal that has a bony skeleton both inside and outside.

The inside bones of the turtle grow through the flesh and spread over the body above and below, making a box with holes for the head and the legs to pass out and in. This shell is covered with horny plates, which, when taken from a particular kind of sea-turtle, are the tortoise-shell of which combs and match-boxes

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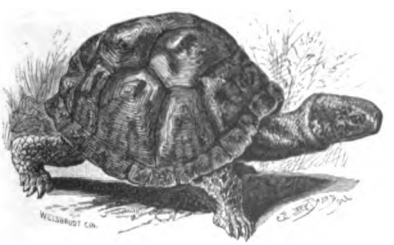
are made. The head is covered with horny substance to protect it. The jaws are hard and are without teeth. The shell-box is so stiff that the turtle can not breathe in the ordinary way. Hence it breathes like the toad, by swallowing the air. The food of the box-tortoise consists of insects, of toad-stools and mushrooms.

The main difference between the land and the water turtles is that the former has stubby feet, while the latter has webbed or finny feet for swimming. Our common turtle likes to live both on land and in the water. There is a kind of box-tortoise which despises the water, exists wholly on land, and sometimes lives to a great age. The Rev. Gilbert White, of England, owned one that had lived among his friends for forty years. A turtle was found in Pennsylvania bearing a date which was known to have been cut in its shell before the commencement of this century; and when last found it was more than sixty years old.



Box-tortoise.

The sea-turtles, which are especially abundant about the Tortugas Islands, are those commonly used for food. The green turtle is preferred for this purpose. Some of these sea-turtles grow to an immense size, a single one weighing as much as four hundred and fifty pounds. The manner of depositing eggs on the sand beach of the islands is thus described by Audubon:

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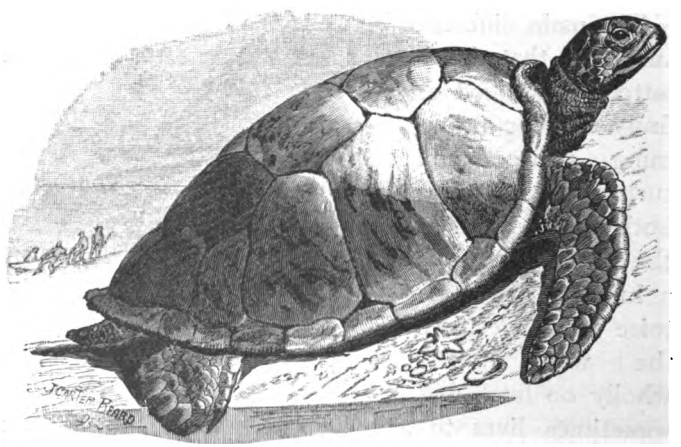
"On first nearing the shore, and mostly on fine, calm moonlight nights, the turtle raises her head above the water, looks around her, and attentively examines the objects on the shore. Should she see nothing likely to disturb her intended operations, she gives a loud hiss-



Green-turtle.

ing sound by which her enemies are startled and driven away. She advances slowly toward the beach, crawls over it, her head raised to the full length of her neck, and when she reaches a suitable place, she gazes all around in silence.

"Then she proceeds to make a hole in the sand with her hind flippers. The sand is raised with one flipper and then with the other, as with a ladle, until it is piled up behind her. In this manner the hole is dug to the depth of two feet. This labor I have seen performed in the short space of nine minutes.

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"The eggs are then dropped, one by one, and arranged in regular layers to the number of a hundred and fifty or two hundred. The whole time spent in this part of the operation may be about twenty minutes. She now scrapes the loose sand back over the eggs, and so levels them and smoothes the surface, that few persons, on seeing the spot, could imagine that any thing had been done to it. This accomplished to her mind, she retreats to the water with all possible speed, leaving the hatching of the eggs to the heat of the sand."

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36. LIZARDS AND CROCODILES.

THE eye will readily detect the difference between the two reptiles, the serpent and the lizard. As the snake has a more perfect body skeleton than the toad, so the lizard is more complete than the snake, and, besides, has four limbs. The limbs are weak, and the lizard shows its cousinship to the snake by touching the under part of its body to the ground.

Like snakes, lizards have been the subjects of a great many notions, stories and superstitions that are entirely without foundation. Many stories have been told about the basilisk of South America and Mexico. It was said that it possessed a deadly poison with which it infected the air; and that the glance of its eye carried destruction. The fact is that the basilisk is entirely harmless and inoffensive. The lizard called the gila monster, of Arizona, gives poison in its bite; but

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nearly all lizards are wholly inoffensive, while they do much good by destroying beetles and other harmful insects.

The horned toad, which is found in some of the states west of the Mississippi, in Colorado and California, is coming to be well known, because it is so pleasing as a pet. It is not a toad, though slightly resembling one. When first caught, a string is tied to its horns, and it is fastened like a chained dog. Soon it becomes very tame, and will take milk and flies from the hands of its friends. It is so bashful that, when looked at sharply, it flattens its body and pretends to be dead. A little tickling of its sides brings back its activity. The dog it especially dislikes, puffing itself up when he comes near, and lowering its horns and hissing in a most ridiculous way.

Horned Toad.

A long step from the lizard brings us to the crocodile and alligator, which inhabit tropical rivers. The crocodile sometimes grows to a length of twenty feet. In Africa it is very abundant, and is dangerous, sometimes catching cattle and antelopes, when they come to drink. Livingstone says it frequently captures little children at play on the river banks.

The ancient Greek historian, Herodotus, describes the crocodile bird, which is a cousin of our plover.

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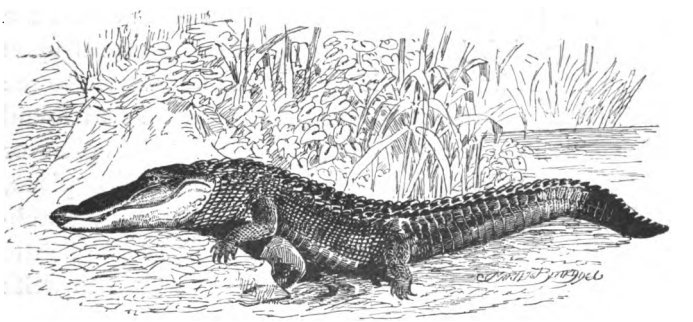
He says that the inside of the mouth of the huge reptile is covered with leeches; and that while all other birds avoid the crocodile, the trochilus (tro'kilus) lives at peace with it. When the animal lies on the beach, it opens its mouth wide to let in the fresh breeze. Then its little feathered friend enters the mouth and picks out the leeches, thus doing great service to the monster. Recent travelers have found this story of Herodotus to be true. The plover has been seen to



Alligator.

walk up and down the back of the crocodile, and to enter its mouth. But when the hunter appears, the bird screeches and wakes up the sleeping beast, when it darts into the water and is safe.

The alligator of Florida is the American crocodile. Its young are sometimes petted, and its skin is made use of for leather. Its greatest length is twelve feet. It does not attack like the African crocodile. Dog meat is especially relished by it, and alligators are said to assemble on hearing the whining of a puppy. Like other reptiles of their kind, crocodiles and alligators lay eggs, which are left in the sand to hatch.

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37. AUBUBON.

AUDUBON (O'du bon) was a great friend of birds—you may have learned that. But do you know that he was one of the great toilers who endured hardship and danger to find out, and to put into convenient form our knowledge of birds? One little incident in his life will show how much such knowledge costs.

In the forests of Florida, Audubon discovered a small gray bird, in color so nearly like the trees upon which it was busy that it was almost impossible to see it distinctly. He could not rest until he had found out about it. He, therefore, procured a field-glass or telescope, made a bed of moss in a concealed place, and there lay most of the time for three weeks, watching the movements and ways of a pair of these little gray birds. By this painstaking he was able to write their history.

For fifteen years he roamed through the forests and over the wild plains of America, with gun, knapsack, and dog. He visited the homes of wild birds from Florida to Labrador, and from the Atlantic to the wilds of the Missouri River. He was exposed to all weathers and climates; to heat, cold, and storm. He not only studied the habits of birds, but with his pencil he drew their forms, and with his brush he painted their natural colors. Then he published to the world two volumes, of elephant folio size (twenty-three by fourteen inches) containing the written history and the colored portraits of over a thousand birds of America.

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To secure a publisher for this immense book he must go to Europe. He landed in England with only one sovereign in his pocket, and without friends or acquaintance. Within two years, in 1828, he had won for his work the hearty interest of the kings of England and France, and had made friends of such great men as Sir Walter Scott and Baron Cuvier (Cü'veā) the great naturalist of France.

By making pictures of animals and selling them, as he said, "at a price scarcely more than the wages of a common laborer," he paid his ordinary expenses. All this time he was inducing men of wealth to subscribe for the book he was trying to publish, at one thousand dollars a copy. Of these subscribers he obtained a hundred and seventy, and completed his great undertaking within five years.

It may be interesting to know what sort of a boy grew into such a man. John James Audubon (which was his full name) was born in 1780 in Louisiana, and died in New York in 1851. He was not poor as were some of the boys who became great men. His father was a Frenchman, who had gained wealth in St. Domingo and in Louisiana; and his life began under orange-trees, among flowers, and in hearing of the wild mocking-bird's song.

His youth was spent at his father's country home in France, where, by a kind step-mother, he was indulged in all that a boy could wish. He pursued the ordinary school branches, and by the famous artist David was taught to draw and to paint. He learned to play the flute and the violin, and became an accomplished dancer. What a singular preparation for

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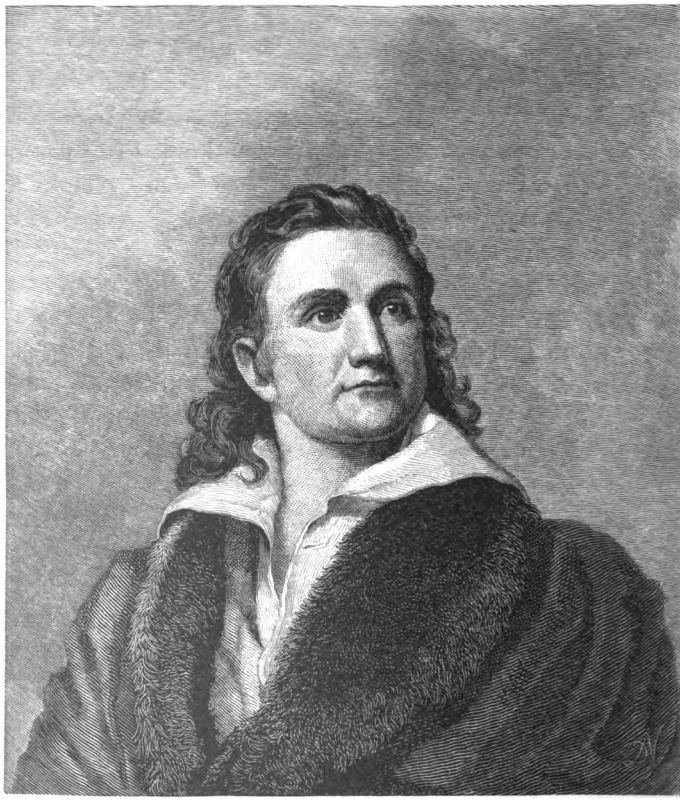

John James Audubon.

a life that must be spent in the camp, in swamps, and woods, and that must be supported on wild fowl, roots, and herbs.

Arrived at young manhood, with plenty of gold, he came to this country and lived by himself on a beautiful farm in Pennsylvania, which his father had previ-

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ously purchased. Here he was gay, and fond of dress. He even hunted in satin breeches and low pump shoes. As during his childhood in France, so now when he was grown, he was always trying to gratify his passion for birds. He had a fondness for all animals, and was skillful in training dogs.

But poverty came to him at last. Through the carelessness and failure of agents, his property was lost. Having married, he removed to Kentucky, where he tried to be a merchant, but failed. He then made his home in Louisiana. His early sports in hunting and fishing had helped to give him a good physical constitution. His polite training fitted him for winning the friendship of all sorts of people.

PART 2.

A SINGLE anecdote will give something of Audubon's earlier experiences. He had to cross the wild prairie in southern Illinois alone, except for the presence of his dog who was his constant companion. When night came, the distant howling of the wolves encouraged him to hope that he was near the wooded country where a camp-fire might be enjoyed. Soon a light gleamed ahead, and a log cabin was at length reached. Here a tall, haggard woman appeared, who consented to allow the traveler to lodge in the cabin. By the fire within sat a young Indian who refused to talk.

Having supped on venison and fed his dog, Audubon took out his gold watch and remarked to the woman that, as it was late, he would like to retire. She cast a longing look upon the treasure, and Audu-

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bon, to gratify her, allowed her to take the watch and to put its chain about her neck. She was greatly pleased, and declared she would be the happiest woman if she owned such a treasure.

This aroused Audubon's suspicion. Then the Indian passed by him and gave him a severe pinch in his side. He now studied both the woman and the red man, but concluded that of the two the latter was his friend. After a while, for the purpose of winding it, he asked the woman for his watch. Taking his gun, he said he would go out and see what the weather promised. Once outside the cabin, he slipped a bullet into his rifle, scraped the flint of its lock, and primed it with powder.

Re-entering the cabin, he lay down on some bear-skins in the corner, with his faithful dog by his side, and soon pretended to be sound asleep. Shortly, two strong young men entered, bringing the carcass of a deer. They asked the mother why that rascally Indian was there, when she hushed them, pointed to Audubon in the corner, and softly spoke of the watch. All this, in the glare of the firelight, the stranger could see with his half-open eyes. He touched his dog, who looked up and seemed to understand what was going on, as if he were human.

When the young men had eaten their supper, the three drank a quantity of whisky, and the woman, like a grim fiend, taking a large carving-knife, went to the grindstone to whet its edge. Audubon saw her pour the water on the stone and turn the crank. It seemed to him that his life was in great danger, and a cold sweat started over his whole frame. Having made

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the weapon sharp, she returned to her sons and said, "There, that'll settle him! And then for the watch!"

Audubon silently touched his dog, cocked his rifle, and was ready to shoot the person who first attempted his life. He had almost risen to fire at the woman, when the door burst open and two stout travelers entered. Audubon sprang to his feet, and the Indian bounded up and danced for joy; for he, like Audubon, had lain in fear of his life. The whole story was soon told, when the woman and her sons were bound, and the next day were carried away and punished.

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38. AMONG THE BIRDS.

WITH a group of wild mallard ducks in view, we begin to learn something about birds. Do you expect a definition of a bird? Let me the rather ask you the question, What is a bird? and leave you to answer it. I think I hear some bright girl saying, "A bird is an animal that flies." Is it, indeed? Is a bat a bird, and are there no birds that do not fly? What about the ostrich, and the penguin which has no feathered wings to fly with?

Another suggests something about feathers. Ah! that springs a thought in the right direction. Now run over in your mind all the different kinds of animals you can think of, and see whether any of them besides birds have feathers. It would be well to get some feathers—a wing, for example—and examine them

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closely, placing a barb of the vein under a microscope, if possible.

Procure the bones of a bird—that ought to be easily done—and see how the frame of the creature is built, and how the different parts suit the habits and purposes of the bird's life. The foot is an interesting piece of mechanism. Have you never found, at the joint where the foot and the "drumstick" meet, a tendon or cord which, by being pulled, will draw the claws in?

Mallard Duck.

You can find it in the chicken's foot; see if it is also in the duck's foot. And now give a reason, if you can, why, when a chicken holds to its roost all night, its foot does not grow tired. If the same arrangement should be found in the duck's foot, of what use would it be, since the duck does not perch? You would find your hand very tired were you compelled to grasp a pole for eight hours without rest.

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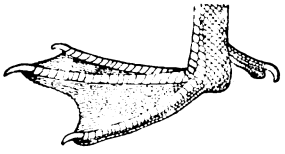
For the purpose of learning something about their general ways and habits, birds may be divided into three large groups: birds of the water, birds of the land, and birds of the air. One thing, however, must be kept in mind, and that is, that a bird has a definite object to live for. This object is threefold; namely, to secure and to eat its food; to protect its young; and to escape from danger.

The duck is certainly a water bird. It can fly, but it can not easily perch, nor can it scratch like a chicken. It is made to get its food, to rear its young, and to escape from danger in or about the water. The duck's body, you will see, is shaped like the keel of a well-made boat. Compare the wish-bone or merry-thought of a duck with that of a chicken, and see how much better the duck's keel is suited to sailing. Then compare the feet of the two, and decide which foot is the best paddle. The chicken's foot has scarcely any web connecting the toes; the duck's foot has a web extending to the ends of the three front toes.

You have noticed, I suppose, that the duck has a ludicrous walk. Some very fat people walk in the same way. Watch a race between chickens and ducks when all are called to be fed. How soon the ducks are left behind. Then watch a hen while the ducklings she has hatched sail on the water—they so happy, and she so miserable. Then the hen is left behind. It is not difficult to decide which one belongs to the water and which one to the land.



Duck's Foot.

The duck's feet are wide apart, and its legs are joined

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to the body far back toward the tail, like the paddle-wheels of a steamboat. The duck's food is largely in the shallow, muddy bottom. Its bill is rather flat and broad, and on the inside is furnished with plates like strainers, by which the food is retained, and the mud and water are strained out, and run away.

The duck finds in the water a protection from danger both for itself and for its young. It can swim swiftly away from enemies that might catch it on shore, and when surprised by the sportsman, it can dive and move for some distance under the surface. The ducklings are covered with down, and can swim and dive as soon as they are hatched, so that they, too, find a comparatively safe home in the water.

PART 2.

THE canvas-back, the mallard, and the fat little teal are the ducks chiefly sought by the sportsman. The tame Rouen duck is really a mallard, and the drake may be known by the green head, white ring about the neck, glossy, black back, and silver-gray under-feathers.

The wild duck is cunning. It often dives, and remains out of sight, leaving the spectator to wonder where it can be. But the sportsman has found that, having swum to shallow water, the bird will lie with its bill and nostrils out of water until danger is over.

The nest of the duck is made under a bush not far from the water. In twenty-eight days the nine or eleven eggs hatch. The mother-bird plucks the feathers from her breast, to cover her eggs. From this

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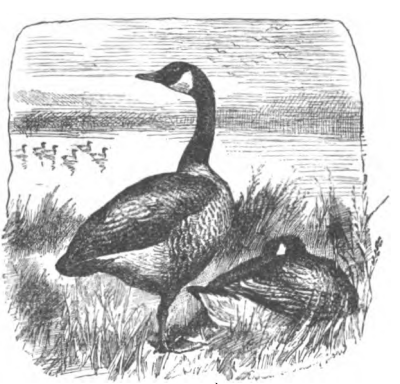
habit the costly down of the northern eider-duck is left to be gathered. When the young are hatched, the mother hurries them to the water to escape the craft of foxes, minks, and snakes.

Wild geese and swans are relations of the duck. Both make a great show of defense, the goose by hissing and the swan by whistling. They make their summer nest far north, but travel southward in the autumn. Wild geese are frequently seen flying very high in the air, in two lines coming to a point like a wedge. In this way they cleave the air more easily. Flying in the night, they make a doleful noise so that they may keep together.

The tame goose is a very ancient member of the poultry-yard, much more so than the tame duck. Homer and other Greek writers speak of it. The Romans kept geese in walled yards, hatched their eggs under hens, and plucked their feathers twice a year. Pliny, greatly distressed at the luxurious habits of his fellow Romans, writes: "Luxury has come to such a pitch that now-a-days men will not rest their necks unless upon a pillow of goose-feathers."



Wild Geese.

Although ducks and their cousins have paddle-feet, they sometimes, to avoid the dangers of the ground,

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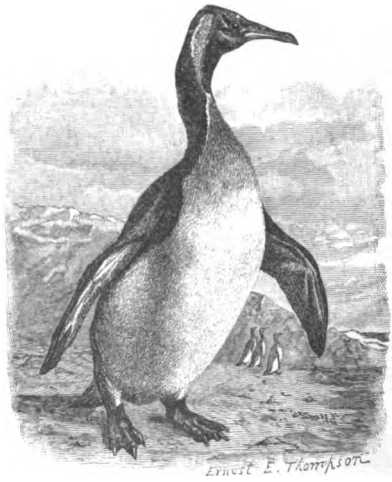
build nests in trees. How the ducklings reach the ground is not known. Of tree-nesting geese, the Rev. Gilbert White, of Selborne, England, who spent forty years in studying animals, says:

"The geese in Richmond Park do roost on trees and make their nests in old oaks, conveying their young to the ground under their wings. All this because, when they made their nests on the ground, the water-rats destroyed their eggs." This being true, it is but just to add that this bird is not half so much of a "goose" as people generally suppose.



King Penguin.

Does the swan ever sing? Pliny says, when about to die the swan retires and sings most sweetly. Ben Jonson called his friend Shakespeare the "sweet swan of Avon." Sharp eyes and ears spoil the old fables. The swan never sings. It is worth little except for its beauty.

The loon, the guillemot, and the penguin are more thoroughly water birds than is the duck. Their bills are differently shaped because their food is fish. The loon, called also the great northern diver, is the prince of all divers. It will dodge a close shot. It is, however, "as stupid as a loon," for a bright-colored flag

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floated on the water will so attract its attention that it may forget to dive at the right moment, and then falls a victim of the bullet. It has a long and powerful wing.

The loon's legs are set further back than the duck's legs. It is impossible for this bird to stand except in a perpendicular attitude. The penguin of the Antarctic seas is more closely confined to the water than the loon. Its wings are without feathers and are used in swimming. It can not fly, and is like the seal among milk-giving animals.

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39. WATER-SKIMMERS AND FLYERS.

AND a good south wind sprung up behind;
The albatross did follow,
And every day, for food or play,
Came to the mariners' hollo!—*Coleridge.*

PASSING from the birds that swim, dive, and use the water to live and move in more than the land or the air, we come to those that are so constructed as to hover over the water, or to wade in its shallow edges in quest of fish-food. Those that pick their food from the surface of large waters, are provided with long and strong wings. Those that enter the edge of the water for the same purpose, are fitted with long legs and long necks. The bills of all fish-eating birds are strong and have sharp, cutting edges.

Among the sea-flyers the albatross is distinguished.

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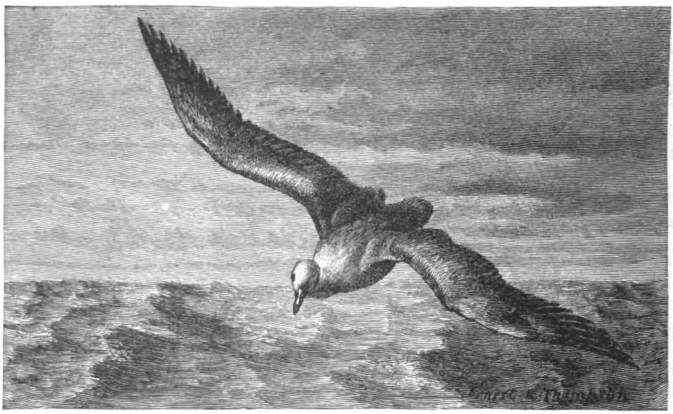
It weighs about fifteen pounds. When its wings are extended, the distance between the tips of them is eleven feet. The albatross will follow a ship for hundreds of miles, to pick up the refuse which may be thrown upon the water. It is furnished with webbed toes so that it may rest and swim on quiet water. "When one of these great birds swoops past the ob-



Wandering Albatross.

server, almost within reach of his hand, it is easy to realize the strength which carries him as he cleaves the air on those huge wings.

"The breeding grounds, both in the Northern and Southern hemispheres, are upon rocky headlands or oceanic islands, and are crowded by countless numbers of birds. There sit the females or the males, as the case may be, upon the solitary dirty egg placed in a slight hollow in the ground. So close are they, frequently, that it is difficult to walk between them,

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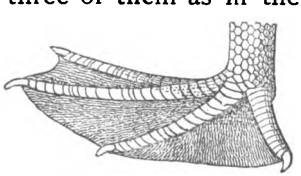
while they take no further notice of the intruder than to pick viciously at his legs. Here, often, on the very spot where this long-winged bird is cradled, a penguin may afterwards bring up a nestling whose wings bear no feathers."

Gulls of many varieties skim about the sea and the inland lakes. They belong with the birds that have strong flying power, with bills for fishing, and webbed toes for swimming, when it is necessary to sit on the water. Their nests are made in the sand of the beach. There are many varieties of gulls.

The tern, or sea-swallow, may be counted as one of these. Pearly white, gentle and harmless, with small red legs and webbed toes, it does much to relieve the soberness of the sea-coast. But the ladies' hats have demanded its life. What would old Pliny say if he were here, and should find that forty thousand of these lovely birds were slain in one year, merely to get their wings for ornaments?

The pelican has full-webbed feet; that is, a web joins all four toes instead of three of them as in the case of the duck. It is found on the Florida coast, and has a bill about a foot long. Attached to its under jaw, is a pouch which holds a gallon, or perhaps six pounds of fish. Into this bag the game is received as soon as it is caught, when the bird retires to a sunny beach and devours the food. There is something here to remind one of the cheek pouches of some monkeys, and of the stomachs of cud-chewing animals.



Pelican's Foot.

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40. WADING BIRDS AND SHORE BIRDS.

I COME from haunts of coot and hern:
I make a sudden sally,
And sparkle out among the fern
To bicker down a valley.—*Tennyson.*

IT is Tennyson's Brook that speaks, and it comes from a wild pond which is the haunt of the coot and the heron. While the reader is learning about the heron, let him learn by heart the whole poem of The Brook. The habits of the different kinds of water-feeding birds are leading us to the shallow edges, and will soon carry us entirely away from broad sheets of water.

American Coot.

The coot is the common little mud-hen of the marshes, and is interesting because of its lobed foot, which has flaps on the sides of the toes. The heron, the stork, and the crane are usually to be seen at the zoological gardens. The stork is a European bird, and in some localities is quite domestic. These waders have long necks; this is because they have long legs. The neck must be long enough to bring the bill back to the ground from which the legs take it away.

Of the several kinds of heron, the large blue heron is distinguished by its long sharp bill, the plume or crest on its head, and the dull blue color of its upper parts. It wades into the water and stands perfectly

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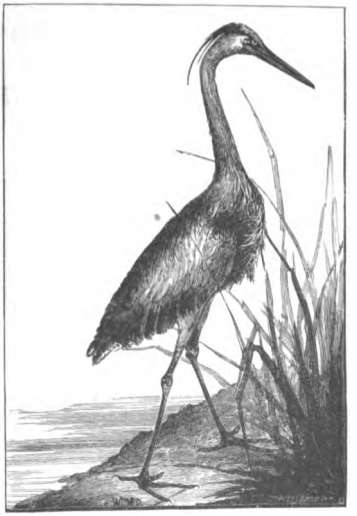
motionless, while watching for a fish to pass by. In this position it may wait for hours, until the fishes conclude that the legs are nothing more than a pair of sticks. Then it darts down its bill with perfect aim and lightning speed, and seldom fails to seize its prey.

The Florida flamingo is a long-legged, snaky-necked wader with a beautiful scarlet plumage. It has a duck's webbed foot which must help it to walk on the water-covered mud where it feeds. The great length of neck enables it to work its bill upside down in the mud. On a slight elevation of earth it builds its nest, and when the female is sitting, she folds her long legs like a carpenter's measuring rule.



Great Blue Heron.

Cranes are either white or brown, and are without crest-plumes on their heads. In their wild haunts they are given to sports and games, and have often been seen jumping and dancing, bowing, and flapping their wings in the most ludicrous manner. The large white whooping crane has in its breast a long windpipe, two and a half feet of which are coiled up, like a French horn, under its breast-bone. This gives it the power of producing a loud whooping sound.

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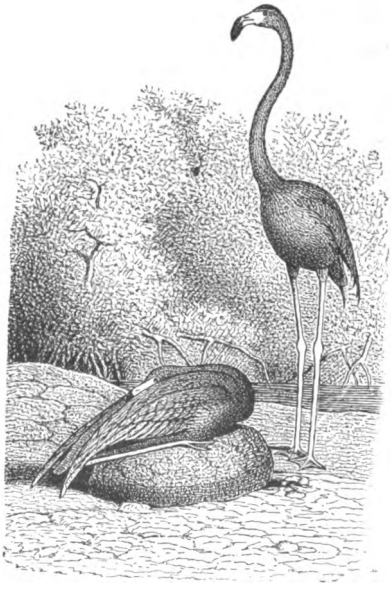
The crane was in favor with the Greeks and Romans because of its yearly visit and its delicate flesh. Thus Homer, the greatest Grecian poet, sings:

> So when inclement winters vex the plain
> With piercing frosts, or thick descending rain,
> To warmer seas the cranes embodied fly
> With noise and order through the mid-way sky.



Flamingoes and Nest.

Homer, and Aristotle, a Grecian philosopher and naturalist, both refer to the destruction which the cranes bring to the wheat fields. They describe a race of pygmies, or dwarfs, who inhabited, it was supposed, a part of upper Egypt. Upon the newly-sown wheat fields of these little people, the cranes suddenly descended from the high air. When the pygmies ran out to drive away the mischief-makers, the cranes gobbled them up and carried them off—so the story goes.

Leaving the waders and the water, we find the legs and feet of the birds change. The legs are shorter, and the feet are not fully webbed. Some of them are

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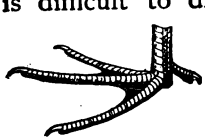
not at all webbed, while others, like some sandpipers' feet, are half-webbed. The snipe family love the damp or marshy ground, for into this they thrust their long soft bills that are provided with the sense of feeling. The bill feels for a worm as sensitively as if it were a finger. The woodcock, now becoming rare at the East, where it has chiefly lived, is the most interesting of the snipes.

White Whooping Crane.

It has a striking head. Its eye is strangely located, and its ear is under the eye. Both old and young are marked so much like the ground and the moss, that it is difficult to discover them. Their brooding habits are quite peculiar. An English sportsman and naturalist says: "From close observation I found that the old woodcock carries her young, even when it is larger than a snipe, not in her claws, but by clasping the little bird between her thighs."



Half-webbed Foot.

Where neither snipe nor woodcock abound, shore-walkers may perhaps be seen. The plover and the sandpiper are closely related to the snipe. So is the lapwing spoken of on page 8.

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The Storks of Delfth.

41. THE STORK.

THIS bird is a near relation of the heron, and has long and slender legs, and a long and rather thick neck. The bill is of the same length as the head, and tapers to a point.

In the countries where it lives, the stork is cherished with the utmost affection. In Holland, the people in the towns and cities place wooden boxes or frames on the tops of the houses or chimneys, to induce the storks to settle there. The birds are perfectly tame, and are thought to bring prosperity to the person who entertains them.

In the winter the stork goes away to Egypt or some other warm country, and comes back with the swallows. The ancient Egyptians almost worshiped it, and it was one of their sacred birds. The reason why this bird is so much beloved is because it destroys the snakes, and rats, and mice, and other unpleasant creat-

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ures that infest the town. It settles fearlessly upon the chimneys and roofs of the houses, and builds a flat nest of sticks, lined with twigs and straw, and dry grass. There are laid three or four eggs of a bluish-white color, and it takes thirty days to hatch them.

In Holland and Germany the stork rears her young in the utmost security on the tops of the houses, and even walks about in the most crowded streets amid men, women, and children, without the least danger. To harm a stork is considered an act of barbarity. The young birds come out of the shell, covered with down, and remain in the nest until the end of summer. The parents watch over them with the greatest attention, and feed them by putting food into their mouths from their own beaks. Nothing could ever induce a stork to leave her young ones; she would rather remain and perish with them.

There was once a great fire in the city of Delfth, Holland. The flames spread to a house on which a mother stork was rearing her young. The little ones were too weak to fly, and their parents did all they could to carry them away. They made many and desperate efforts, but it was all in vain, and the little ones were obliged to remain in the nest.

Meanwhile the fire came nearer and nearer, and you would think the old storks would be frightened and fly away. But no; they still refused to leave their little ones, and staid close by them. Even when the flames closed round the nest they did not stir, choosing rather to die with their young than desert them.

After such a touching history, one does not wonder that the stork is respected and beloved.

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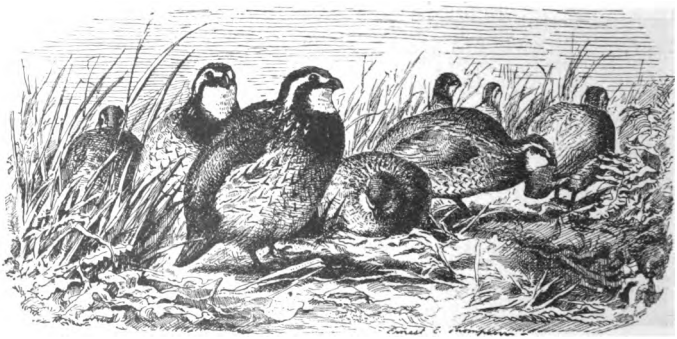
42. BIRDS OF THE LAND.

THEY are brought to mind by the crowing of the cock in the yard; by the cackling of the hen in the hay-loft; by the gabbling of the strutting turkey gobbler; by the brassy clicking of the shy guinea-fowl; by the shrill, doleful cry of the gorgeous peacock, and by the cheerful whistling of Bob White sitting on the fence. These birds of the land may fly



Group of Quail.

or perch, but the ground is their home. Here they find their food, make their nests, and rear their young.

What tools have they for life on the ground? They must dig for worms, grubs and insects. They must be able to peck through a chestnut-shuck or hazel-nut. They have a host of enemies to contend with. Foxes, rats, weasels, and opossums on the ground; and hawks, owls, and eagles in the air, are watching for their flesh, and they are an almost constant terror by

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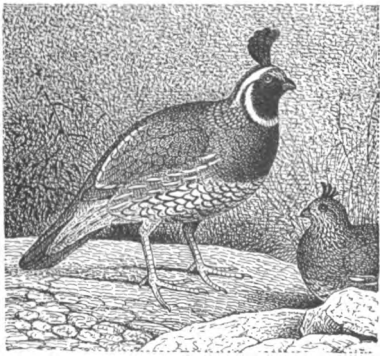
day and by night. These they must either fight, or escape from by flying or by running.

A short, stout beak, with the upper jaw turning its sharp point a little down over the under jaw, gives them a good instrument to peck with. What could they do with the bill of the duck, or the crane, or the woodcock? The leg is of medium length, is set near the middle of the body, and is suited to running. The foot ends in four toes. The hind toe is set a little higher than the three front ones, and is long enough to cling to the perch. The front toes have scarcely any web between them, and are armed with thick, strong claws for scratching. What could these birds, that must scratch for a living, do with such claws as ducks and snipes have? The wings are strong, and rather round than pointed; but they are good for flying short distances.



California Quail.

Every one, who as a child lived in the country, retains pleasant recollections of Bob White. His true name is Virginia partridge. He is ten inches long, and he has a very near relation—the ruffed grouse—which is sixteen inches long. In New England and the North, this grouse is called a partridge, and Bob White a quail. In the Southern states Bob is named a partridge.

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Bob White's habits are similar to those of his near kin—the prairie-hen, the ruffed grouse, the California helmet quail, and several other scratching birds. The nest is made on the ground, usually in a tuft of grass under a bush. From twelve to twenty white eggs are there deposited, and when the brood is hatched they are far more lively than chickens. I have often come upon the little hen-quail with her chicks. She is then a most skillful actor. She flutters before my feet, pretends to be lame, and to have a broken wing.

The growing brood becomes a flying flock or "covey." The covey keeps very closely to the ground. They run swiftly. They roost on the ground. On trees or bushes they would be too much at the mercy of hungry owls. When preparing for the night, they huddle together in a close circle with their tails at the center and their heads at the circumference, so that, when surprised, they may fly in all directions.

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43. THE CAMEL-BIRD.

THE true camel-bird is the ostrich of the African plains. Its kindred are the South American ostrich, or rhea, and the emu of Australia. The African ostrich has two toes, and the others have three toes on each foot. The feathers of none are so fine as those of the camel-bird. When full-grown, this bird stands about seven feet high, and weighs from a hundred to a hundred and fifty pounds. Its wings are too short for

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flight, although they help to increase its speed, when running.

The ostrich is strictly a land bird. Its breast is flat like a raft, and not keel-shaped like the breast of the swimming and flying birds. Its usefulness consists almost wholly in the beauty and value of its rich plumes. Long before King Pharaoh of Egypt used the feathers for royal ornaments, the ostrich and its gay dress were known and prized. Since it has become a member of the public gardens, and has been introduced upon farms in California, great interest has gathered about this feathered camel.

In the wild desert plains, the bird is so shy and wary that it is hunted and captured with great difficulty. The swiftest Arab horse would never run it down, were it not that the horse can endure longer than the ostrich.

The nest is scooped out in the surface of the sand, and in it several birds may deposit their eggs. The males do the sitting, and are more affectionate to the young than are the females. During the heat of the day the nest is left to the power of the sun. The egg of the ostrich is about six inches long, and weighs as much as twenty-four eggs of the common hen.

On the farms in south Africa and in California, the eggs are gathered daily from the nests, and are afterwards hatched in artificial ovens, or incubators. The Romans used something like the incubator for hatching. The habit which the old birds have of eating stones, bits of iron and glass, pieces of leather, and almost every thing that happens to be lying about, seems to begin early in life. The young birds are

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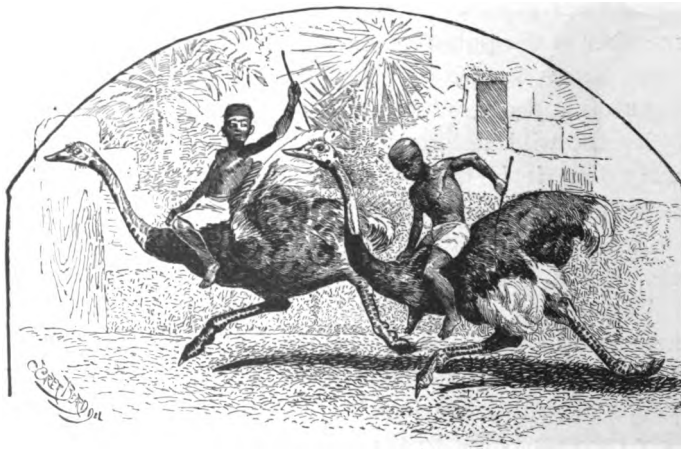
plucked at six months of age, and about every six or nine months thereafter. The feathers of a grown bird, at a single plucking, have been sold for a hundred and fifty dollars.

When Rome was at the height of her luxury a dish of ostrich's brains was considered a great treat. A gluttonous and cruel emperor had as many as six hundred ostriches killed to make one meal of brains.



South African Ostriches.

"A traveler was once staying in a village where there were two tame ostriches. Two little boys used to mount on their backs, and have a ride. The ostriches would run round and round the village, and never seem inclined to stop. At first their pace was a trot; but by degrees they expanded their wings and ran very fast indeed, scarcely seeming to touch the ground. No race-horse could have kept up with them, though the ostriches would have got tired much the soonest."

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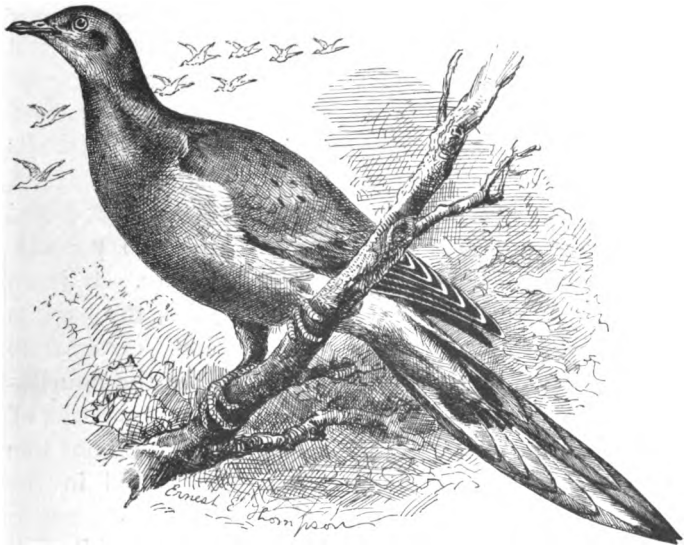
44. BIRDS OF THE AIR—THE PIGEON.

THE pigeon would fare poorly on the ground; much more so in the water. Its feet look as if they might scratch, but they are far from being a match for the quail's feet. Ground birds must be runners. But the pigeon can fly—indeed it can. The wild pigeon, next



Wild Pigeon.

to the frigate-bird of the ocean, is the swiftest of flyers. From seventy to a hundred miles an hour is its rate of speed. It seeks safety in its wings. Its food grows mainly upon trees. It sleeps in the tree-top. It nests there. It is a bird of the air.

The passenger pigeon is seventeen inches long from

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tip of bill to tip of tail. The mourning dove of our orchards is twelve inches long. The common barn-pigeons, and all the fancy birds—pouters, carriers, runts, barbs, fantails, tumblers, trumpeters, and so forth, including a hundred and fifty varieties—are derived directly from the wild rock-pigeon of Europe.

Pigeons eat fruit, seeds, and grain. I have shot them at their roosts in the far north, and found their crops filled with large acorns. I wondered how they could swallow, and much more how they could digest the hard, bitter things. But the pigeon has a good stomach. The crop is double, and softens the hard shucks and kernels, after which the gizzard, with its pair of ribbed mill-stones, grinds them well.

The young pigeons are hatched both naked and blind, and are carefully tended by the two parents. You have heard, perhaps, of pigeons' milk. It is no fiction. When there are young to be fed, the parents have glands in their crops which secrete or separate from the food a kind of milk; and this is the nourishment which the old birds pump into the mouths of their tender squabs. Then the pigeon drinks, not like a chicken, but like a horse, holding its bill in the water till it has enough.

The true carrier pigeon, which is now called by fanciers the homing pigeon, is by far the most interesting of the tame varieties. It may wear a variety of colors, and is a most meek, modest, delicate looking creature. Its instinct or love for home has been cultivated for a great many centuries. It is trained by taking it short, and then longer distances from home, and allowing it to return on the wing. Even as far

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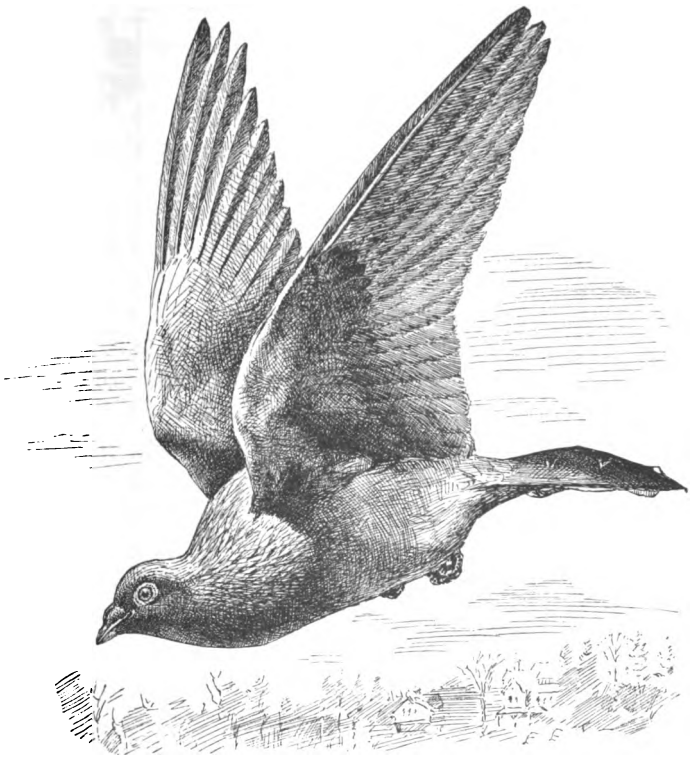

Homing Pigeon.

back as five hundred years before Christ, the messenger pigeon was employed to convey letters between lovers. The letters in those days were tied to the feet; in these days the message is tied to the tail feathers, as shown in the illustration. The speed of these birds is about fifty miles an hour, in a trip of five hundred miles. The Romans employed messenger pigeons to convey messages in war.

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Bald Eagle.

45. "LIONS OF THE AIR."

WERE the birds of prey arranged in a line according to their sizes, there would be at one end of the row the pigeon-hawk eleven inches long, and at the other end the South American condor three and a half feet long, from bill to tail, and nine feet between the tips of its extended wings.

Young readers in the country are acquainted with these "lions" through the chicken-hawk and the owl.

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City folk may, perhaps, see the king of the air as a captive in the zoological garden. It is fondly hoped that every reader carries in his pocket, at least occasionally, a feeble portrait of him impressed on one side of the American silver dollar.

They are great flyers. The condor of South America soars to the height of twenty thousand feet above the level of the sea. These creatures have a wonderful power of sight. Vultures and turkey buzzards find the dead bodies on which they feed, not by scent, but by sight. The fish-hawk, at a height of over a hundred feet in the air, can see a minnow under the water. The owl at night can discern a bat as quickly as a cat spies a mouse in the dark.

Of eagles there are two prominent kinds in this country. The golden eagle lives in mountainous districts. The bald eagle, or "bird of Washington," shows itself occasionally in nearly all parts of the country. It is not really bald, but when three years old has its head covered with white feathers. The bald eagle is a grand, princely bird in appearance, and for this reason was chosen as our nation's emblem. The great and good Benjamin Franklin objected to its selection for that purpose, and preferred the turkey.

The lion of the African desert is not better armed for his lordly cruelty than are these lions of the air. What beaks they have! Strong, short, sharp-edged, and hooked. What fearful claws! These are the first birds we find that use the claw as a hand. The living prey—the mouse, the chick or the child—is caught and held by the claws, and is borne away. The claws of the Alpine eagle are not fitted for this work.

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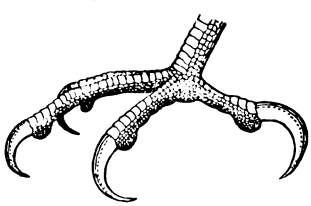
The story of this eagle causing the death of Æschylus (E'skilus) may be true; and if so, it is a warning to bald-headed people to wear their hats in the presence of great eagles. Æschylus was a Grecian poet who lived about five hundred years before Christ. On account of some serious charges made against him, he was banished from his country and took up his residence in Sicily. Once, while sitting in a wild and secluded place, with his smooth and venerable head exposed, the great Alpine eagle was sailing in the air above him, carrying a tortoise.



Seizing Claw.

It is the habit of eagles and of some other birds, when they have a turtle in hand, to rise high in the air and drop it on a rock so as to break its shell. At this moment, when the poor old man was thinking of nothing but his heart troubles, the eagle mistook him for a rock; and with wonderful precision, let the tortoise drop on his bald head. And alas! Æschylus was killed.

Eagles, hawks, and buzzards are diurnal birds of prey. Owls are nocturnal birds of prey, and are called "cats of the air." Nearly all birds have the eyes on opposite sides of the head, so that with one eye they can watch their prey, while with the other eye they can observe the movements of their enemies.

Owls going out on their hunts at night, are not in danger from other stronger inhabitants of the air, for these are all asleep. They have only to look for their victims; and, therefore, their eyes are in the face or

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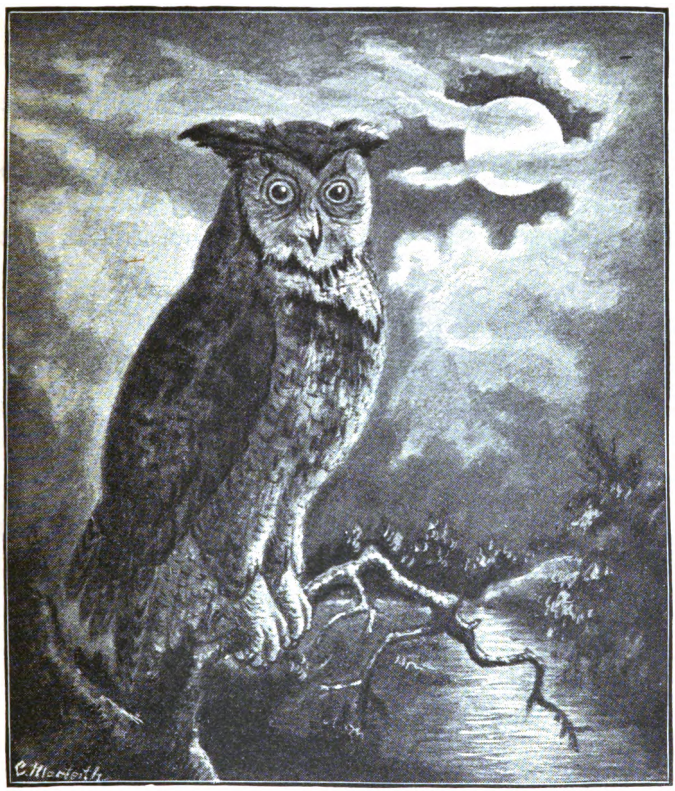

Great Horned Owl.

front part of the head. They have beaks and claws essentially like those of the day-birds of prey.

Our most common night-birds of prey are the little screech owl, about nine inches long; the barn owl, fifteen inches long; the snowy owl, two feet long; and the great horned owl of the same length.

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46. MONKEYS IN FEATHERS.

THE monkey is an imitator of man's actions, while the parrot is a mimic of man's talk.

That "Polly" has a high degree of intelligence no one can doubt, for he sometimes talks in such a way as to indicate that he reasons. A parrot show was

Gray Parrot.

held in the north of England, at which prizes were offered for the best talking powers. Several birds had exhibited their efforts, when a gray parrot was let out of his cage. Seeing the large company before him, he at once exclaimed, "By- Jove, what a lot of parrots!" The prize was at once given to him.

The climbing organs of the parrot are all plain to

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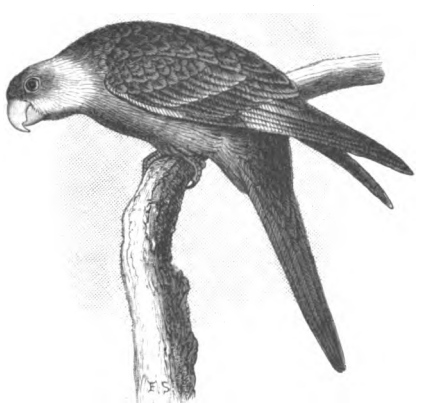
the eye. First the bill—how odd and awkward it appears! But it does nice work. The under jaw is a stumpy, stubby affair, but presses up, and cuts and cracks with great power. The upper jaw turning down like a long curved hook, moves up and down on a kind of loose hinge.

The birds of prey make quite a hand of the claw. The parrot's claw is still more of a hand. The hawk throws three toes forward for fingers, and one backward for a thumb; the parrot extends two before, and two behind for thumbs.



Carolina Parrot.

The little green Carolina parrot, or parakeet, is the only member of the order which is native to our country. It is a genuine parrot. Its color is green, with a yellow head, and it is about twelve inches long. In former times, say seventy years ago, it was abundant as far north as the Ohio River, and was seen even at Albany, New York.

The ring parrot, which is also present in the garden, is from India and Africa. It was the only one known to the ancients. Aristotle, the Greek naturalist, refers to it as the "Indian bird which is said to have a tongue

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like a man, and to be most talkative when intoxicated." The large gray parrot is from Africa and Madagascar. It is the best talker among parrots.

A parrot in Pennsylvania recently brought about a lawsuit. Two men had an angry dispute about a bill, in a room in the house of the debtor. As they raised their voices to a high key, a shrill voice in the next room cried: "Kick him out! kick him out! kick him out!" The creditor thought it was the debtor's wife who was advising him to commit assault.

Springing up in a great rage he said he would go without being kicked out, but he would surely be heard from. He then went straight to a justice of the peace, and brought suit. At the trial it was proved that it was a parrot, and not the man's wife, who had advised the kicking out.

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47. RED-HEAD AND HIS MUSIC.

Of our ruby-throat humming-bird, Mr. Burroughs says: "Nature has given him a jewel upon his throat, but no song save the hum of his wings." His wing-power is almost a miracle. While he examines a flower he stands in the air. His bill is like that of the woodpecker, and enables him to draw out an insect from the bottom of a trumpet-flower.

Something about their bills gives interest to the flicker or yellow hammer, to the little spotted downy woodpecker, and to our common red-head. This bill

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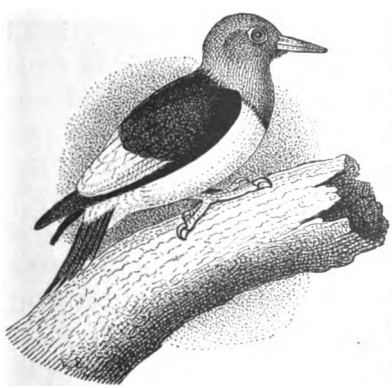
of the woodpecker does the work of a gimlet and chisel. The tongue within the bill is even more remarkable. On the end of it are barbs, and it gives out a sticky fluid, so that the tongue can reach far into a worm-hole and pull the victim out of its retreat.

Yoked Toes.

The toes of these birds are a little like those of the parrot. They are yoked. Two are thrown before and two behind, so that they can more easily cling to the bark or bare wood of a tree's trunk. The tail helps a little to hold Red-head up; for you will observe that he presses his tail against the tree.

Does the woodpecker sing? The Duke of Argyle, who lives in Scotland, after watching very closely, concluded that this bird with a chisel-bill makes music to please his mate, as truly as the thrush or robin does; only his music is instrumental. The woodpecker is a drummer. He often thumps his bill on a dead or dry limb, merely to please his companion. Now let me describe what I have seen and heard.



Red-head.

One day I was walking on the railroad track, when I heard a tapping and ringing noise from the top of a telegraph pole. The noise began and ended at regular intervals. Carefully moving my position, I saw him and

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caught him in the act. Red-head had found a better drum than a hollow tree; he was drumming on the glass knob, or insulator, of the telegraph pole.

Several times he flew away and as often returned, each time beating the ringing tones from the glass, evidently as happy as a small boy with a new drum. Had I known, when I was a boy, about this musical trick in Red-head, I should not, as I frequently did, have left his charmed mate a widow.

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48. THE CANARY.

After the death of my wood-lark I was so grieved at the loss, that my father bought me a pair of canaries, the first of these birds I had ever seen. I was delighted, charmed, and never weary, for at least two hours, of contemplating the bright yellow dress of the male, and the pale, primrose costume of his mate.

It was spring-time when they were given to me, if I remember rightly, and the cage was hung in the window of the nursery. How splendidly that bird sang! The nightingales in the little beechen copse at the foot of the garden, were as nothing compared to him, I thought; and very likely he sang louder than they did. After a time, my mother put a little wicker basket lined with flannel into the cage, and in a few days four or five little pale-blue eggs, speckled with brown, were laid.

The young were hatched in due time, to the great

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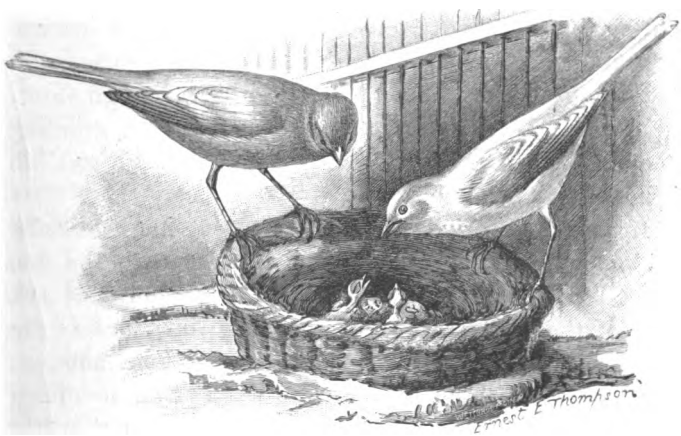
delight of the parent birds who stood together on the edge of the basket, attentively looking down at the ugly, helpless, pink little things below.

The origin of the tame canary is, unfortunately, lost in obscurity; for the story that connects it with the shipwreck off the Island of Elba and the Canary Isles is voted by common consent as unworthy of belief. However that may be, there are at the present day several distinct varieties of canary.



Canaries.

Canaries vary in song as much as they do in shape and color. Some have the sky-lark, others the wood-lark, and still others the nightingale note. Some have a song consisting of loud, harsh shrieks which is very unpleasant to listen to. A canary, if taught while quite young, will generally pick up any air that is regularly whistled to it, or played on a flageolet; but the lesson must be often repeated.

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49. THE CROW.

THE common American crow is black, like the three crows of the old story. It is a foot and a half long. The raven is about two feet long, and is simply a larger crow. Crows make their presence known by their "cawing," which is not a very pleasant noise; it can not be called music or song.

The crow has a fine eye, and a rather long and strong beak. The food it prefers consists of insects, worms, grubs, mice, moles, and shell-fish—rather soft food, you observe. The bill of the bird, though stout, is not hard, nor is his stomach adapted to grinding and digesting hard food. When a bird has a soft bill it also has a soft stomach.

If a crow is driven by hunger to eat hard corn, he seldom swallows the kernel whole, but with the fine curved point of his bill picks out the germ or soft part of the kernel. In corn-planting time, before the mice, beetles, and bird's eggs, which they love, abound, the crow-family visit the farmer's planted corn. They soon find out that the old men set up about the field have neither muscle, blood nor bone; and they dig up and devour the sprouting seed. Why? Because this corn has become soft, and the bird can digest it.

The wit and cunning of this bird in a clerical dress is proved, when it becomes a tamed pet. A writer in the *Indiana Farmer* says: "We have a pet crow that was taken from the nest last spring, and if there is any thing that escapes him I do not know what it is. He will carry away knives, spoons, forks, screw-driv-

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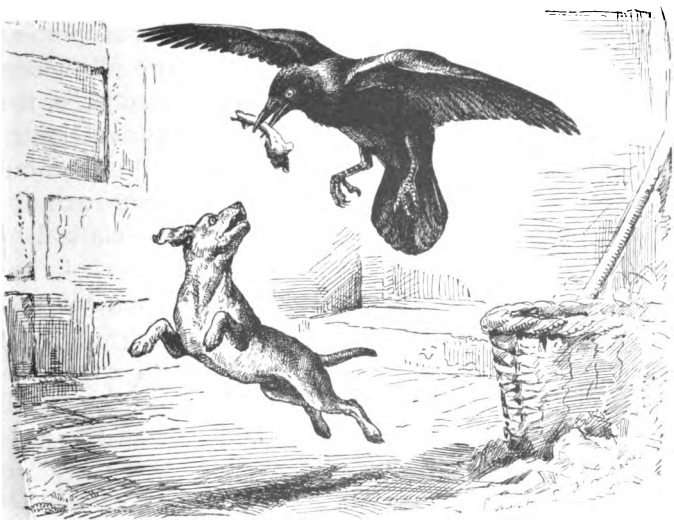
ers, tape, or nails. One day, while our backs were turned, he stole the blueing-bag out of the wash-tub, and we had a big chase before we got it again.

"We have a pup. His name is Gip. The crow's name is Jim. The pup and the crow play together like two kittens. It makes no difference which name we call, they will both come. Mischievous Jim has



Jim and Gip.

the advantage of Gip, as he can fly up when he has any thing in his mouth that he doesn't want Gip to have. Jim can bark like Gip, or laugh like us; and he can make more different kinds of noise in one hour than any bird I ever saw, or heard of. He will untie our aprons, and will steal every pin from our clothes, and all the buttons he can find."

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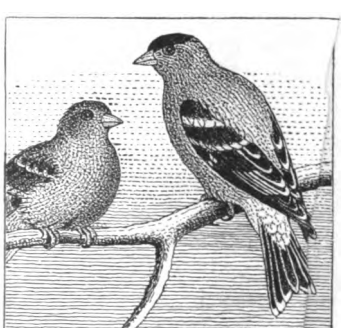
50. FACTS ABOUT BIRDS.

THE foot of the robin, or of the canary, is a poor tool for scratching. The long hind toe is sadly in the way. On the chicken's foot this toe is short, and is set up out of the way. How do these little birds move on the ground? What birds of the air walk like the chicken, putting one foot before the other? With long toes and exceedingly sharp nails, the robin's foot is made to cleave tightly around a twig. We call it a perching foot. The hind toe grasps precisely opposite the middle front toe.

Robin's Foot.

The canary cracks and eats seeds and cuttle-fish. Is not its bill fitted for such work? The robin, or the brown thrasher, picking its worm from the sod has use for a longer bill, while there seems to be no need of a hard bill. The canary is a seed-eater; the robin is a worm-eater.



Goldfinches.

The canary and its numerous cousins form a family of finches. The robin and its kin are a family of thrushes. The question may arise why some birds migrate to warmer regions to pass the winter, while others remain throughout the year. Those that go are mostly worm-eaters, whose food the winter hides or destroys. Those that stay are

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chiefly seed-eaters, whose food is not covered by snow or frost.

Many birds have air-tubes connecting their lungs with their hollow bones; so that, in flying, the air passes into all parts of the body and makes it lighter. The real mystery of flight is in the birds' wings. Could any thing be at once so light and so strong as the quill, which is the lower, naked part of the feather?

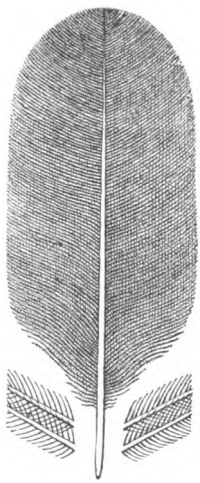
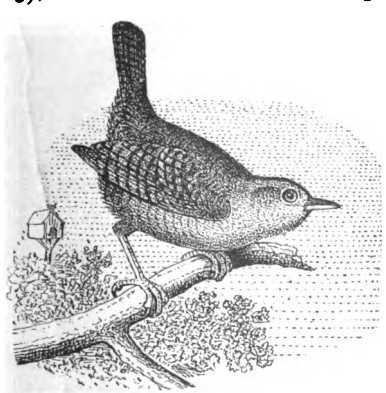


Fig. 13. Feather.

Then look at the vane, or web, which is fastened to the after-shaft—the upper part of the feather. Each layer of the vane is called a barb, and cleaves closely to its fellow by hooks, or barbules, as is seen in the magnified barbs (Fig. 13), on either side of the quill. This arrangement makes the feather a wonderfully strong and light oar to row the bird-ship.



House Wren.

Young birds, like young children, must learn their songs. The singing muscles of the child are in the upper part of the windpipe, and can only be successfully used by practice. The singing muscles of the bird are in the lower part of the wind-

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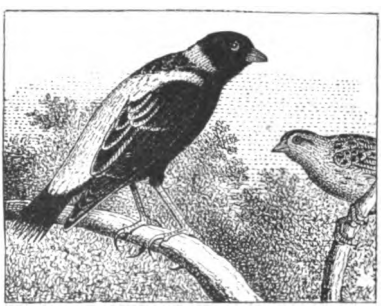
pipe, and the bird acquires the art of using them by practice.

The useful birds, and the birds of song, must be protected. Chimney swifts, and swallows, with deep-cut mouths for catching flies on the wing, are our friends. The little house-wren, though saucy, is a nice singer, and should have a box for its nest. A thousand insects, in a single day, have been carried by a pair of wrens to their young.



Bobolinks.

Among the starlings, that have stout, rather long and cutting bills, are the oriole, the meadow-lark and the bobolink. The bobolink is the only black and white bird west of the Mississippi. He is full of joy and music. Of all the songsters none takes deeper hold of the heart than the song-sparrow—he is so cheery, so trustful of his human friends. He sings from seven to ten different tunes.

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51. A BIRD NATION.

THE pilgrim fathers and mothers of the innumerable nation of house-sparrows came from England to this country, in the year 1852. It was a mistake to bring in seed-eaters to catch canker-worms. In England, a

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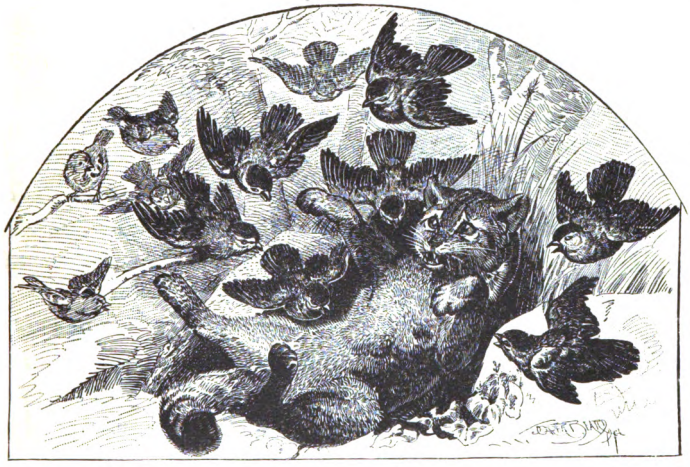
hundred years ago, they were disturbers; and they were charged by Mr. White, of Selborne, with destroying swallows, robbing martins, and indirectly increasing harmful insects.

But they came; and after a few generations, they found this great, free country just the place for a great sparrow nation. Living in our villages and cities, they would escape the terrors of owls and hawks. So they



House-sparrows Attacking a Cat.

have gone on increasing, learning all the bad ways of city life, but none of the good ways. From a single pair come five or six broods a year; and, if unopposed, two hundred and seventy-five billions of birds in ten years. They have already spread over a territory of one million square miles.

There is a long list of crimes against them. They delight to plunder lettuce, peas, beets, cabbage, fruit

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buds, and fruit of peach, pear, plum, cherry, apple, and grape. Fifty of them have been counted on a single shock of farmer's grain.

They kill and drive away useful birds and sweet singers; so that, in place of the inoffensive and musical wren, robin, and song-sparrow, we have the plunder and *creech-creech* of the house-sparrow. Besides making war upon our pretty home birds, they refuse to do the useful work of these birds. The tussock caterpillar, that devours the foliage of nearly every tree, is so covered with sharp bristles that most birds will not touch it. But the oriole, the robin, and the cuckoos attack it, and the yellow-billed cuckoo even shears the bristles of the worm before swallowing it. The armies of our little ruffians, however, drive away the robins and the cuckoos, and leave our trees to the mercy of the caterpillars. They will not work for us, nor will they allow our old friends to work for us.

Song-sparrow.

As fighters, they have no equals among small birds. One alone is weak, but many together are strong. When one gets into trouble he calls a regiment to help him. In one instance, they are reported to have killed a cat. But they make good pot-pies. Let us then rise and eat the sparrow nation, or the sparrow nation may grow strong enough to eat us.

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52. THE GREAT SINGERS.

THE poets are lovers of children, flowers, and birds. Without the song of birds, the summer would be as cheerless as if it were without children and flowers. But there is a difference in the power and sweetness of bird-song, as there is a difference in the beauty of flowers and the attractiveness of children.

European Nightingale.

The English poets lead us to think that no feathered songsters can compare with the sky-lark and the nightingale. The poet Montgomery tells us something of their habits:

"The bird that soars on highest wing,
Builds on the ground her lowly nest;
And she that doth most sweetly sing,
Sings in the shade when all things rest.
In lark and nightingale we see
What honor hath humility."

The nightingale, called Philomel, seems to have been the favorite bird of Milton:

"Sweet bird, that shun'st the noise of folly,
Most musical, most melancholy,
Thee, chantress, oft the woods among
I woo, to hear thy evening song."

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English Sky-lark.

Americans are usually disappointed when they first hear the sky-lark and the nightingale. They think our own great singers have finer voices, though we have fewer great poets to extol them.

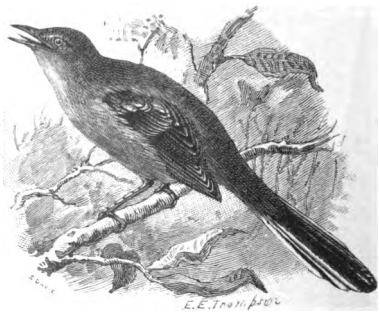
The sky-lark sings while it soars, and pours its notes down upon the ear, when itself has risen out of sight. Hence Shakespeare says:

"Hark! hark! the lark at heaven's gate sings."

And Tennyson adds:

"And drowned in yonder living blue,
The lark becomes a sightless song."

With the first warm breath of summer, our wood thrush, with reddish back and mottled breast, plays his flute, sweet and clear, in rising and falling measures.



Mocking-bird.

And we have our nightingale, or night-singer—the Southern mocking-bird. His best song is in the woods, where Longfellow finds him singing to the sad heart of Evangeline in search of her lover in the wild South-west:

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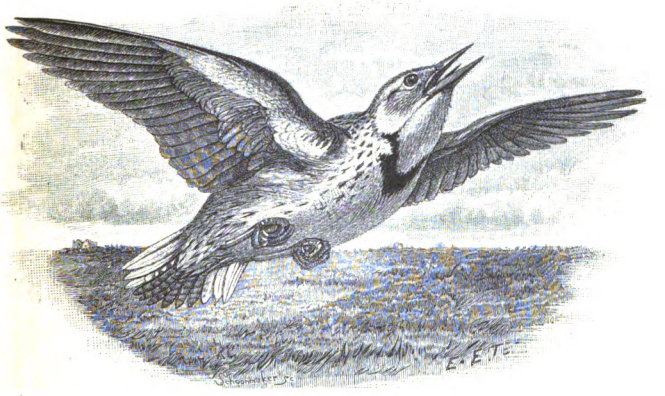
"Then from a neighboring thicket the mocking-bird, wildest of singers,
Swinging aloft on a willow spray that hangs o'er the water,
Shook from his little throat such floods of delirious music,
That the whole air and the woods and the waves seemed silent to listen."

Mr. Champlin, of New York, with a coaching party in England, witnessed the flight and song of five sky-larks together. After this unusual concert, he says of the American mocking-bird's song: "It is sweeter,



Prairie-lark.

richer, mellower, more varied and more brilliant, of greater compass, more powerful and more prolonged than that of any songster in British woods."

Our most remarkable bird-vocalist seems to be the western meadow-lark, or prairie-lark. Because of its superiority, and because few had noticed it, Audubon called it *neglecta*. It is essentially the same, in form and colors, as the common meadow-lark, or starling.

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It differs in habits, and is greatly superior in song. In the prairie country of the North-west, it sings early and late in the season; early and late in the day. It sings at rest and it sings while soaring.

Mr. Ernest E. Thompson, whose experienced hand has drawn many of the bird-pictures that adorn these pages, has made the acquaintance of all the great singers, at home and abroad, in their native haunts; and of the prairie-lark he says: "It is one of two or three great ones of the world of bird-song."

We have, also, our sky-lark. In the region of the upper Missouri River is the Missouri titlark, that rises into the air while he sings a tune which some people think quite equal to that of the European sky-lark.

Let us open our ears and hearts to the beauty and melody of the birds. Like the joy of the sunshine and flowers; like the cheer of pleasant faces; like the charm of kind words, good books, and loving friends, they help to lighten the load of life.

Wood Thrush.

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